1940

Annual Report of the Department of Agriculture in the Province of Bombay, 1938-39

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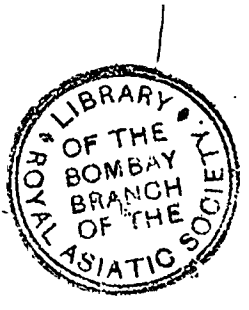
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MAP SHOWING
ORGANISATION OF GUN-CLUBS AGAINST WILD ANIMALS IN THE SOUTHERN DIVISION.

1 VARAHA
2 CHIGALLI
3 BACHANAKI
4 SAMBRANI
5 TERGAON
6 HULIKOP-GALGI
7 KALAKERI
8 ARAWATGI
9 ALNAWAR
10 KAKERI
11 BIDI
12 NANDAGAD
13 KHANAPUR
14 TURKEWADI Co-operative Crop Protection Society.
15 HERA
16 KANUR
17 DADDI
18 ANKALGI
19 BIRNAL
20 CHOLACHAGUDDA
21 KUDALGI
22 MUNDAGOD
23 KUMBHARWADA
24 MANCHIKERI
25 MADNUR
26 TELAGERI

PIGS KILLED IN 1938-39 ... 567.

Total number of villages 218; Pigs killed so far 2593; Crop area protected (90,000) acres.

Campaigns against deer in Ron (a) and Gadag (b) Talukas Deer killed so far. (OVER 500); Crop area protected (18000) acres.

○ This shows number of Gun-Clubs.
○ This shows number of Deer Campaigns.

S S Shah
Rural Development Inspector I/C. Shikar work Dharwar.

G.P.Z.O. POONA, 1940.

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PROVINCE, 1938-39.

CHAPTER I.

FEATURES OF THE YEAR.

CLIMATE AND RAINFALL.

(1) The agricultural season of 1938-39, considering the *kharif* and *rabi* seasons together, was, on the whole, fairly satisfactory, and proved better than its predecessor. The only exception to the above general statement was found in the North Gujarat district where the season proved disappointing. Throughout the season, the rainfall in this area was deficient and, accordingly, the crops were adversely affected. The outstanding feature of the season was the early arrival of the monsoon rains which strengthend rapidly and resulted in heavy precipitation in the early part of the *kharif* season. As a result, field operations were somewhat hampered and the progressive growth of early sown crops was arrested. Moderate rains with occasional breaks occurred during the months of August and September and facilitated the normal progress of field operations while establishing ideal conditions for the growth of standing crops. At this period, the monsoon conditions gave hopes of very satisfactory *kharif* crop harvests and good yields appeared to be certain. However, the heavy rains, which fell at the end of September and in the begining of October, caused considerable damage to the standing crops which were nearing maturity at that time. The inopportune and excessive rains had the effect of reducing considerably the anticipated favourable crop returns for the *kharif* season. For the *rabi* crops, however, the late rains proved beneficial, though sowing operations were delayed by about a fortnight owing to excess of rainfall. These crops made good progress but the subsequent absence of favourable rains after October had a somewhat adverse effect on their outturn.

CROPS STATISTICS, ETC.

(2) The following tabular statement compares the actual acreage sown and the estimated tonnage of the food grain

crops produced in the different divisions of the Province during the years 1937-38 and 1938-39 :—

Division.	Area in thousands of acres.		Estimated outturn in thousands of tons.	
	1937-38.	1938-39.	1937-38.	1938-39.
	Acres.	Acres.	Tons.	Tons.
Gujarat	2,453	2,490	692	608
North Deccan	3,714	3,779	748	745
South Deccan	7,532	7,423	1,000	1,055
Karnatak	4,867	4,973	631	859
Konkan	1,615	1,614	678	632
Total for the Province ..	20,181	20,279	3,749	3,899

The table indicates that the yield of food crops was satisfactory in the South Deccan and the Karnatak. In the former division, however, notwithstanding a decline in area, the resulting outturn showed an improvement over that obtained last year. The drop in yield in Gujarat was due to the season being unfavourable in the North of the division, while the reduction in the yield in the North Deccan and the Konkan was due to similar adverse conditions resulting from late heavy rains, which caused considerable damage to the *kharif* crops.

(3) The following statement shows that, taking all crops together, there has been little alteration in the total area sown during the preceding four years. The area under food-grains and groundnut showed a slight increase over last year, while the area sown with cotton in 1938-39 has decreased compared with the previous year, probably due to fall in prices.

Year.	Area (in thousands of acres) sown with different crops in the Bombay Province.			
	Food-grain crops, i.e. cereal and pulses.	Cotton.	Groundnut.	All crops.
	Acres.	Acres.	Acres.	Acres.
1934-35	20,149	3,657	682	26,039
1935-36	19,847	4,163	891	29,373
1936-37	19,945	3,714	987	29,171
1937-38	20,181	3,862	1,344	29,684
1938-39	20,279	3,699	1,436	29,740

(4) The prices of rice and *jowar* showed a slight improvement over last year, while that of *bajri* was stationary. The prices of export crops had slightly declined as can be seen from the sub-joined table.

Prices prevailing at harvest time for Agricultural produce in seers of 80 tolas per rupee except for cotton, which are recorded in rupees per khandi of 784 lbs.

Year.	Food crops.			Export crops.		
	Jowar (Sholapur).	Bajri (Nasik).	Rice (Thana).	Wheat (Ahmedabad).	Broach Cotton (Bombay).	Groundnut (Karad).
	Seers.	Seers.	Seers.	Seers.	Rs.	Seers.
1934-35 ..	15	11	9	11	261	18
1935-36 ..	21	13	8	8	207	13
1936-37 ..	16	11	7	7	234	10
1937-38 ..	17	11	9	10	168	14
1938-39 ..	16	11	8	11	160	15

(5) The actual fluctuations in cotton prices can be seen from the following statement which gives the prices in rupees per *khandi* (784 lbs.) of Broach cotton at Bombay during the year under report :—

Month 1938.	Price in rupees.	Month 1939.	Price in rupees.
	Rs.		Rs.
August	148	January	..
September	144	February	153
October	..	March	157
November	..	April	157
December	..	May	171
		June	172
		July	161

(6) *Sugar Prices.*—As in the previous year, the prices of Indian and Java sugar have been given for comparison. Similarly, average *gul* rates for the month of March, April and May in Poona are given in a separate statement.

Statement showing prices of Sugar (Indian and Java) for August 1938 to July 1939.

Month.	Prices of sugar at Bombay per cwt.	
	Indian.	Java.
1938	Rs. a. p.	Rs. a. p.
August	11 8 1	15 8 0
September	12 6 10	15 8 0
October	13 0 3	15 11 0
November	12 15 2	15 12 0
December	13 9 7	16 0 6
1939		
January	13 13 2	16 9 0
February	14 6 7	15 13 0
March	15 2 8	15 11 3
April	15 10 2	15 15 0
May	16 15 4	....
June	15 10 7	15 9 3
July	14 14 4	14 10 0

Statement giving average gul rates for the months of March, April and May.

Year.	Price of *gul* per *palla* of 250 lbs.	Area of cane in the Deccan.
	Rs.	Acres.
1931	15·66	40,238
1932	15·33	42,389
1933	10·79	45,592
1934	14·06	43,418
1935	18·59	47,832
1936	12·00	54,760
1937	10·75	56,632
1938	14·87	48,005
1939	24·94	53,794

The high prices of *gul* may be due to shortage of the cane crop in the United Provinces and to low carry overs. The shortage of cane was due to drought in Meerut, Agra and Rohilkhand divisions and floods in some parts of Benares and Gorakhpur districts. The cane crop also suffered from the attack of Pyrilla (insect) and red-rot in Sitapur, Hardoi and Kheri districts. The cane crop of the United Provinces in 1938-39 was put at 71 per cent. of the normal as against 77 per cent. in 1937-38. This seems to be one of the principal reasons why the prices of *gul* in the season of 1939 were high.

CHAPTER II.

AGRICULTURAL RESEARCH AND INVESTIGATION.

(7) *Introduction.*—Scientific research work on agricultural problems is the most important duty of the Agricultural Department; indeed, research and experiment are the essential foundations of all its other activities. The Department could not assist cultivators to improve their farming methods, reduce the cost of cultivation, combat plant diseases and insect pests, produce better crops and livestock and market their produce to the best advantage, without first studying and investigating how these things should be done. This work continues to be carried on more and more intensively at numerous Government research stations and experimental farms throughout the Province and, in addition to increased financial provision for scientific research work on agricultural problems being made by Government, an ever-growing series of scientific investigations are being carried out with the assistance of the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and the Sir Sassoon David Trust Fund. Details of the subventions received, during the year under report, from these bodies are given in paragraph (103) of this Report.

(8) The scientific research work done during the year under report by the Agricultural Department in the Province has only been very briefly surveyed in this chapter. More detailed accounts of such experimental work will be found in the Appendices. The first section of this Chapter deals with major fundamental research schemes connected mainly with soil and irrigation research, viz., the Bombay-Deccan Sugarcane Research Scheme, Padegaon, and the Bombay Dry Farming Research Scheme, Sholapur. Other sections deal briefly with scientific work on crop improvement in all its aspects, control of plant diseases and insect pests, livestock research work, economic investigations into agricultural problems and, finally, miscellaneous items of scientific investigation regarding cold storage research work, agricultural engineering, etc.

(9) At the instance of Government, a review of the present position of agricultural research work in the Province was made at a meeting of scientific research workers of the Agricultural Department held in Poona in May, 1939. As a result of the discussions at this meeting, the Director of Agriculture has prepared a booklet entitled, "Summary of the

present position of agricultural research in the Bombay Province with suggestions for the extension of such work in the future". This booklet is in the press and will shortly be published for public information.

Section I.

Soil and Irrigation Research.

A. *The Bombay-Deccan Sugarcane Research Scheme, Padegaon.*

(10) This Scheme, which is financed jointly by the Provincial Government and the Imperial Council of Agricultural Research, was extended for a period of three years from 1937. The year under report is thus the second year of the extension period. The research work is being carried on under three main sections, viz., soil physics, crop physiology and agricultural management, and is directed towards the investigation of fundamental soil and irrigation problems in relation to sugarcane cultivation in the Bombay Deccan.

(11) (*a*) *Soil Physics Section.*—During the seven years for which the Scheme has been in force, the work done in the Soil Physics Section has been increasingly concentrated on the practical application of research results towards the solution of problems connected with the management of different types of soil under cane cultivation and irrigation, trials of green manure crops, soil classification, crop rotations and the behaviour of soil types under various irrigational, manurial and cultural treatments. In the elucidation of the genetic processes of soil formation, analyses of the clay fraction and the murum have been made. Interesting results have been obtained from the study of the variations in the properties of soil types in their different depths and such work, it is anticipated, will facilitate the preparation of large-scale soil maps of the Deccan Canal tracts in the future. The results of the work done under the soil fertility surveys in the Godavari Canal areas indicate that the majority of cane soils show a higher clay, but a lower silt, content than the adjacent, unirrigated soils, thus indicating a mechanical breakdown of the coarser particles as a result of cane cultivation over an extended period. On the same canal tract, it has been shown that the deterioration of cane soils is usually associated with an increase in the carbon : nitrogen ratios in the soils which confirm the results previously ascertained in the Nira

Left Bank Canal area. The results of detailed biological studies in both cane and fallow plots at the Research Station, carried out over a period of four years, have revealed the nature of periodic fluctuations in bacterial numbers and their bearing on the nitrogen cycles in such soils under various irrigational, manurial and cultural treatments. Investigations regarding the effects of rotational crops on the soil have been continued. It has been found that as a result of soil exhaustion consequent upon the growing of the cane variety (Co. 419), with low manurial applications, the yields of subsequent *kharif* crops were adversely affected. In *chopan* soil profiles, under fallow conditions, alkalization of the surface soil was found to occur in the hot weather due to the upward movement of soluble sodium salts. The cultivation of *shevri* and lucerne on such lands appears to be effective in checking this harmful development. Work on the reclamation of *chopan* soils was directed towards the improvement of the physical condition of the soil and was reflected in increased outturns and in improved quality of *gul* and, also, in the better growth of cotton crops on the lands under such reclamation experiments.

(12) (*b*) *Crop Physiology Section.*—Detailed investigations into the inter-relationship of the daily growth of cane, atmospheric humidity and soil moisture, have revealed that, with an optimum soil moisture content of 40 per cent. and above, the rate of growth is determined by the humidity. As the soil moisture percentage falls below this figure, the effect of humidity on daily growth rate is not so marked. Studies in the inter-relationship of water and manure, which have been in progress for three years, have conclusively proved that, while better development of the crop and higher cane tonnages can be obtained with increasing doses of nitrogen up to 300 lbs. per acre in both the varieties under trial, viz., P.O.J. 2878 and Pundia, increased watering, i.e., 130 inches per acre has, on the whole, given no advantage over lower watering, i.e., 95 inches per acre under such manurial treatments and, indeed, in the case of the Pundia variety, the increased irrigation application produced a deleterious effect in the later stages of the crop growth. From the standpoint of maturity, the lower irrigation application results in delay, especially where the high dose of nitrogen, viz., 300 lbs. is given. In connection with investigations into the drought-resistant power of different cane varieties, it has been observed that varieties possessing a thin spreading root system are

better suited to shallow soils as their efficiency in penetrating the limited soil depth is greater than that of varieties with thick roots capable of penetrating to deeper layers. Detailed biochemical investigations into crop nutrition have proved that, once the soil has attained its level of available phosphate, additional applications of superphosphate do not show any improvement either in tonnage or in earlier maturity. The delay in maturity, resulting from increases in nitrogenous top-dressings, is found to be due to the high nitrogen and low phosphate and potash content in the cane juice. The common opinion among sugarcane cultivators regarding the harmful effect of flowering has been found to have no basis in fact as flowered canes invariably weigh more and attain maturity earlier than the non-flowered canes. Research work has been carried on with cane cultivation on different soil types in lysimeters and the outturns on such types are being compared in addition to the water requirements. Investigations into the effects of " earthing up " the cane crop have shown that the prevalent idea that such a process, done at a suitable time, accelerates growth and increases outturn is not correct. In this connection, the time of application of manure is of much greater importance.

(13) (*c*) *Agricultural Management Section.*—In this Section, work was continued in the direction of water cum manure experiments and, for Pundia, the optimum requirements have been found to be 225 lbs. N. and 95″ irrigation water per acre. For P.O.J. 2878, the optimum quantities are 300 lbs. N. and 130″ irrigation water. Other experimental work on different applications of phosphatic and nitrogeneous manures to different cane varieties and on different soil types are also in progress. With regard to varietal tests of cane, it has been found that the variety Co. 426 has given higher outturns of both cane and *gul* than the Pundia or P.O.J. 2878 varieties. This Co. 426 variety is softer than the other Coimbatore types and forms a suitable substitute for Pundia in cultivators' cane areas. In the final varietal tests, the Coimbatore varieties Co. 414, Co. 421 and Co. 426 were all found to be superior, or, at least equal to P.O.J. 2878, Co. 419, and Co. 408 did well in July and October plantings and Co. 413 in October plantings. Co. 419 and Co. 413 showed a greater response to increased nitrogenous top-dressings than other varieties under trial. Experimental work on the time of sowing of Banilla cotton indicated that the last week of April was better than later sowings. A cheaper and more effective method of converting

cane trash into compost has been worked out and the final product has been found to be more economical than farm-yard manure.

B. The Bombay Dry Farming Research Scheme, Sholapur and Bijapur.

(14) This Scheme is financed by the Imperial Council of Agricultural Research and the Provincial Government and constitutes one of a series of dry farming research stations in the scarcity or famine tracts of India. The Scheme was commenced in 1933 and was originally for a period of five years, which was extended for a further period of 1½ years in 1938. The sixth year's work under the Scheme is dealt with in this Report.

(15) *Seasonal conditions.*—At Sholapur, the agricultural season of 1938-39 proved to be one of the wettest seasons of recent years. The total rainfall during the year amounted to 37·30 inches which represents an excess of almost 40 per cent. over normal. This rainfall was mostly received during the south-west monsoon period extending up to the beginning of October. About 75 per cent. of the total precipitation was received in the form of heavy falls of rain, causing surface run-off. There was no rain after the sowing of the *rabi jowar* crop and, as a result, this crop did not succeed on the shallower types of soil. On the deeper soil types, the *rabi jowar* crop was also much below normal. At Bijapur, the agricultural season proved to be extremely satisfactory and excellent harvests of all the important crops, namely, *jowar*, cotton and wheat, were obtained at this centre. The total rainfall amounted to 28·93 inches which was about 25 per cent. in excess of normal. The distribution, however, was extremely favourable as there was rain every month from May to December.

(16) *Soil investigations.*—Soil moisture determinations have shown that, in spite of the excess of rain during the early part of the monsoon, the light, shallower types of soil, are incapable of retaining moisture sufficiently long to provide adequate soil moisture for the *rabi jowar* crop. At Sholapur, soil moisture, however, was in excess during the seedling stage of the *jowar* crop, especially in the medium deep soils, and this condition inhibited root development. Annual ploughings were found to increase the clay content of the 2″ to 4″ layer of the light shallow soils and had an adverse effect on the

development of the root system of young *jowar* seedlings. Continued studies of murum disintegration indicated no further increase in the thickness of the soil layer as compared with that of the previous year. During the year under report, heavy rains, causing run-off of rain-water, occurred fifteen times at Sholapur and twenty-five times at Bijapur. As a result of these run-offs, the water lost from the plots under *rabi jowar* at Sholapur amounted to nearly 7″ and at Bijapur to nearly 5″. The estimated quantity of silt lost during the run-offs of rain-water was 33·3 tons per acre at Sholapur and 15·7 tons per acre at Bijapur. Lysimeter studies showed that, under the high rainfall at Sholapur, the loss of water by under-ground drainage from a medium deep soil of 18″ depth exceeded 20″. At Bijapur, the corresponding figure amounted to only 2·6″. Such drainage water removed large quantities of fertility elements in solution.

(17) *Physiological studies of the jowar plant.*—Experiments on the water requirements of the *jowar* plant at Sholapur and Bijapur have confirmed the results obtained in the previous year. The addition of farm-yard manure to the soil was found to result in more economical use of water by the *jowar* plant. The differential requirements of water in certain strains of *jowar*, which was observed in the previous year, were not maintained in the succeeding generation during the year under report. Experimental work on various treatments such as pruning, removal of tillers, vernalization and the use of onionised water were tested at the Sholapur Experimental Station but no advantage was indicated by any of these treatments.

(18) *Agronomic work.*—The intensive agronomic experiments, mentioned in previous reports, were continued during the year. On the light shallow soils at Sholapur, the effective results obtained from the practices of bunding, scooping and mulching in previous years were confirmed. Manuring with farm-yard manure and green manuring with sann gave increased yields on both types of soil at Sholapur. This effect was very much more marked at the Bijapur station. The increase resulting from farm-yard manuring amounted to 62 and 70 per cent. in the deep and limy soils, respectively. The increase in grain yield, due to sann green manuring, was only 19 per cent. in the deep black soil but 117 per cent. in the limy soil. Fallowing in alternate years gave increased outturns but the increase obtained was inadequate to

compensate for the loss of one year's crop. The crop rotation of cotton and *jowar* was found to be more advantageous than continuous *jowar* cropping. Field scale trials of the improved Bombay Dry Farming method again resulted in increased yields of both grain and straw at Sholapur and Bijapur. This increase in yield was much more valuable at Sholapur than at Bijapur where the seasonal conditions were more favourable. The respective yields from the Bombay Dry Farming method in comparison with the cultivators' method at both Sholapur and Bijapur, are given in the table shown below :—

Method of cultivation.	Sholapur.			Bijapur.		
	Area in acres.	Grain.	Straw.	Area in acres.	Grain.	Straw.
Local cultivators' method ..	6·6	33	333	7·2	387	530
The Bombay Dry Farming method	24	146	442	22	577	660
Increase in lbs. per acre ..	..	113	109	..	190	130

From the costings which have been maintained for the two methods dealt with in the above table, the improved, i.e., the Bombay Dry Farming method, shows an appreciable extra net profit over the local method. It is interesting to note that the improved method though primarily designed for unfavourable rainfall conditions, was found to be superior even in a year of favourable rainfall, as can be noted from the results obtained at the Bijapur Sub-station in the season under report.

Section II.

The Improvement of Crops.

A. COTTON.

Gujarat.—In Gujarat, the work of cotton improvement is centred at Surat, Broach and Viramgam where the main object of the botanical research in progress is to obtain improved strains of cotton which, when extended in general cultivation, will give higher returns per acre to the cotton-growers.

(19) *Surat—Botanical work on cotton improvement.*—The work in progress aims at the production of a type of cotton with a higher ginning percentage and better yield of seed cotton per acre than the improved type 1027 A.L.F. which is now being widely grown in the district. At the same time, the improved strain sought for must, as far as possible, possess all the desirable fibre qualities of 1027 A.L.F. The selections, mentioned in the last year's report, have maintained their high ginning character and better fibre quality this year. One such selection was found this year to be earlier in boll opening by at least two weeks and it is proposed to test this in comparative yield trials from the next year. Selection work was continued in all the crosses and back-crosses, including those intended for combining wilt resistance with desirable economic characters and which were grown on the wilt infected plot at Shera in the year under report.

The work on interspecific hybridization, financed by the Indian Central Cotton Committee, has resulted in obtaining fifteen fertile back-cross plants, combining the various characters of both the Asiatic and American parents and providing interesting and valuable material for further study.

(20) *Broach—Broach Cotton Breeding Scheme.*—This botanical scheme for the improvement of the Broach cotton crop is being financed by the Indian Central Cotton Committee and the year under report is the seventh year since the commencement of the work. The object of the research work is the combination of all desirable economic characters, viz., high yield, high ginning percentage, better quality and wilt resistance in one cotton suitable for wide extension in the cotton-growing tracts of Broach and Panch Mahals district. Replication tests of the nine most promising segregates from the cross B.D. 8 × G.A. 26 (F. 8) and the back-cross (B.D. 8 × G.A. 26) (F. 1) × B.D. 8 (F. 6) were carried out in both wilt-infected and wilt-free soils and indicated that all the segregates were highly resistant to wilt attack as is the case of the B.D.8 parent. They also all have a ginning percentage of over 40 per cent. and five of them are superior to B.D. 8 in fibre length.

(21) *Viramgam—Botanical work on cotton improvement.—(Dholleras Cotton Breeding Scheme).*—The main object of this research scheme is to obtain types of Wagad cotton which will be superior to the local varieties in yield, quality and earliness of maturity. Selections have now been obtained which

possess a higher ginning percentage and give a better fibre length than the local Wagad and further work with this material is in progress. Certain of these selections also promise to be superior to the local varieties in yield. The F.1 crosses of Wagad strains with Herbaceum types obtained from outside India were found to flower two to four weeks earlier than the local crop. In yield tests, Segregate 4-1 has been compared with Wagad 8 since 1933-34 and has consistently been better in ginning outturn and about equal in lint yield. The improved strain has also a better spinning value than Wagad 8. So far, however, there is no difference between the two cottons in the final monetary return per acre.

Khandesh.—In Khandesh, cotton improvement work is centred at Jalgaon and is directed towards obtaining high-yielding and wilt-resistant strains superior to the improved variety, Jarila, which represents the main achievement of past botanical research work on cotton in this tract.

(22) *Khandesh Cotton Breeding Scheme.*—At Jalgaon, cotton breeding work is financed by the Indian Central Cotton Committee, and this is the second year of the extension period of the scheme for a further period of five years. The rigid yield trials of the N. V. strains, mentioned in the last year's report, were dropped as from this year none of them were found superior to Jarila. In 38 district trials on cultivators' fields, Jarila yielded more than the local variety in 16, gave equal results in 10 and yielded less than the local at 12 centres. Yield differences between Jarila and local varieties, however, were not significant as was the case in 1936-37. The ginning outturn of Jarila varied from 33 per cent. to 38 per cent. and its spinning value was from 27's to 30's as against 22's to 36's of the last year. A lint sample from Taloda gave an exceptionally high ginning value of 38's, partly on account of its silky feel not possessed by other samples. This Jarila cotton fetched a premium varying from Rs. 7 to Rs. 48 over Broach, per *khandi* of 784 lbs. The improved variety was found highly wilt resistant, even in the most severely wilt infected areas of the district.

In order to aim at achieving wilt immunity in Jarila, the Jarila × N.R.5 F. 1 cross was crossed with New Million Dollar, a wilt immune strain supplied by the Plant Pathologist, Poona. Further selections have been made which show superiority in staple length, ginning percentage and yield over

the average Jarila type and these will be grown next year in the wilt affected plot in order to judge their respective degrees of wilt resistance or immunity.

Southern Division.—Cotton improvement work in the Southern Maratha Country is centred at the Government Farm, Dharwar, and is directed towards the improvement of the Kumpta and Dharwar American cotton crops, particular attention being given to increased yield, better quality and wilt resistance.

(23) Four selected strains of Kumpta cotton, viz., Jayawant, New Jayawant, Early Jayawant and Dharwar No. 2, were compared with local Kumpta in replicated yield trials. The variety, Jayawant, proved superior in all respects. Work on other promising strains is in progress. A study of the inheritance of wilt resistance in the above strains is being continued. With regard to Dharwar American cottons, selected strains from the cross Gadag No. I × Cambodia (Co. II) were tested and promising material has been retained for further study. Spinning tests of the improved strains have been carried out.

(24) *Miscellaneous.*—The Plant Pathologist to Government, Agricultural College, Poona, is carrying on scientific research work on the production of immune or highly wilt resistant strains of cotton as a complement to the cotton breeding schemes at Broach, Jalgaon and Surat. The technique has now been fully developed and, as will be seen from his report (Appendix K), very satisfactory results have been obtained already.

(25) Agronomic and manurial experiments in connection with cotton cultivation were continued at all Government farms and research stations where this crop is cultivated. Significant increases in yield per acre of cotton were obtained in green manuring experiments at Surat Farm with *dhaincha*, with or without the addition of small applications of farmyard manure. The cotton-*jowar* rotational experiments completed their fifth year at the same centre and interesting results are being obtained.

B. RICE.

(26) Scientific research work on the improvement of the rice crop in the Province is being carried on at various centres, notably, at Karjat for the rices of the Kolaba and

Thana Districts, at Mugad, for the rices of the Southern Maratha Country and at Kumpta and Ratnagiri for the rice crops of the Konkan.

In the Southern Division, rice improvement work at the Mugad Rice Breeding Station was developed and testing of 7 strains of the early Dodya variety was carried out. Improved strains of Mugad and Antersal rices were also under study and the more promising material has been retained for further work. Trials of Non-Bombay rices indicate that certain imported varieties may prove useful under particular environmental conditions in local rice tracts. District trials of improved paddy strains, evolved at Mugad, were conducted and confirmed the superiority of this material over the local crops. At the Kumpta Farm, similar work on Konkan rices was continued and improved strains of Muskaty, Jeddu, White and Red Halga and Mugin Beldu varieties have now been obtained and are under trial in the districts. These improved strains are definitely higher-yielding than the local varieties which they are intended to replace.

At the Karjat Rice Breeding Station, four of the selections in the Zinya variety, mentioned in last year's report, have been found promising from the point of view of yield but further selection in samples gathered from a wide tract is in progress. Selection work was also done in the Bhadas, Kada, Jirbuti and Mahadi varieties of the Konkan and promising material obtained for future work. Similar investigation is being conducted in rice varieties from outside the Konkan, particularly, Sathi from West Khandesh, Sutarsal from Thasra and scented varieties. Yield trials of hybrid Kolumba strains were carried out.

C. WHEAT.

(27) Wheat breeding work is concentrated at the Cereal Breeding Station, Niphad, which is under the control of the Crop Botanist to Government. During the year under report, the selection B.G. 8-1 was tested in replicated yield trials with selections 808, 168 and local. This improved strain, which has also better quality, appears very suitable for parts of Nasik district. The promising selections from crosses mentioned in last year's report were studied and the best strains selected and retained for further test. With the establishment of a rust research station at Poona and Mahableshwar, as sanctioned by the Imperial Council of Agricultural Research, work on the breeding of rust resistant varieties of wheat will be

greatly facilitated. The scientific research on the botanical aspect of wheat improvement will be closely co-ordinated with the rust research work.

D. OTHER CEREALS.

(28) At the Cereal Breeding Station, Niphad, scientific work on the improvement of the *bajri* crop was continued although it is desirable that this investigation should be transferred to an area more suited for *bajri* cultivation at the earliest opportunity. Similar work on *jowar* crop improvement was carried out at Niphad and at Jalgaon and improved strains are being tested in replicated yield trials. At Mohol, further selection of Maldandi *jowar* strains was done and the most promising material tested on the Farm and in the districts. Trials of improved strains of Fulgar White, Fulgar Yellow, Nandyal and Bilchigan were tested on cultivators' fields in the Southern Division.

E. TOBACCO.

(29) At the Nadiad Tobacco Breeding Station, Gujarat, the selections in the Keliu variety, viz., K-23, K-24 and K-49, showed superiority in yield over the local type by 57 per cent., 78 per cent. and 63 per cent., respectively, in line yield trials. These improved varieties are being tested in replicated plot series. With regard to cigarette tobaccoes, eight old varieties and four new varieties were badly attacked by virus disease and only Harrisons Special was studied in detail for economic characters, etc. Experiments on the technique and economics of flue-curing were continued.

A new tobacco breeding station was started during the year under report at Nipani for scientific work on the improvement of the important tobacco crop in the Southern Maratha Country. The main lines of work will be (*a*) selection and breeding of high yielding and superior quality strains from the local varieties, (*b*) multiplication of pure seed of improved strains for distribution, (*c*) improvement of yield and quality by cultural and rotational methods and (*d*) trial selection and curing of cigarette tobacco. Samples of local types of tobacco were collected from seventeen centres and grown as a basis for preliminary selection work. Material has been selected for further study next session. Work on cigarette tobacco could not be commenced in the year under report.

F. OTHER CROPS.

(30) (*a*) *Linseed.*—The year under report was the first year of the extension period of the Linseed Breeding Scheme, financed by the Sir Sassoon David Trust Fund and directed by the Economic Botanist to Government. District trials of eighteen selections, made as a result of previous work, were carried out in Sholapur, Nasik and Bijapur districts. Certain of these selections proved superior to local varieties but further testing is necessary. Hybridization between promising selections and C. P. White and Pusa L. T. 6 was effected during the season. Developmental and root studies are in progress.

(31) (*b*) *Other oil-seed crops.*—The Economic Botanist to Government is carrying on botanical improvement work on safflower, niger and sesamum with the object of obtaining higher-yielding strains possessing a better oil-content. Numerous selections have been made but this work is still in its initial stages. Selection work on Spanish Peanut was continued at Dharwar Farm and comparative yield trials of improved strains are in progress. At Dohad, a varietal test of groundnuts was held in accordance with the scheme proposed by the Imperial Council of Agricultural Research. The improved variety No. 334 appears to be superior to the other varieties under trial.

(32). (*c*) *Castor.*—The improved strain, mentioned in last year's report, viz., S. 20, again gave higher yields than the local Gujarat varieties and this variety is now ready for extension in the districts.

(33). (*d*) *Gram.*—At the Poona Agricultural College, the Economic Botanist to Government has made a collection of samples of *udid* (black gram) from all over the Province and botanical work towards the selection of superior types has been commenced. Yield trials of improved gram varieties were carried out by the Crop Botanist to Government and the improved strains No. 816 and No. 693 among early types and No. 822, a late type, yielded significantly higher outturns than the local varieties. At Dharwar Farm, the wilt-resistant strain No. 18-12 proved its superiority to local and other varieties in replicated yield trials.

(34). (*e*) *Grazing and fodder crops.*—The Economic Botanist to Government continued his work on grazing and pasture improvement near Poona.

During the year under report, a Provincial Fodder and Grazing Committee was constituted in pursuance of the recommendation of the All-India Conference held in May 1937. This Committee has held two meetings since its formation at which several subjects relating to research work on grazing and fodder crop improvement were discussed in detail. Among the most important of these subjects were proposals for the establishment of a Central Grass and Fodder Crop Research Station and a survey of all grazing and grassland areas in the Province.

Section III.

Livestock Research Work.

(35) (*a*) *Cattle.*—Livestock research work on cattle improvement is centred mainly at two Government Cattle Farms, viz., at Chharodi for the Kankrej breed and at Bankapur for the Amrit Mahal breed. At Chharodi, special attention is being paid to the production of an economical animal with the desired breed chatacterstics. Emphasis is laid on the important points of early maturity, regularity and good milk production. At Bankapur, the herd of Amrit Mahal cattle has now reached a high degree of uniformity in type and conformation. The breeding policy which is being followed there is on the same general lines as at Chharodi.

(36) (*b*) *Sheep.*—The year under report represents the second year of the Sheep Breeding Research Scheme at Bhamburda, Poona, financed by the Imperial Council of Agricultural Research. During the year under report, considerable progress was made in the direction of the objects of the scheme which are to evolve a type or breed of sheep superior to the present indigenous sheep, to improve wool production and to study the effect of the introduction of the Merino and its cross-breed progeny under Deccan conditions. Other minor research items deal with the time of lambing, economic methods of shearing, treatments of wounds and ailments and improvements in the preparation of wool.

(37) (*c*) *Poultry.*—The scheme of research in poultry Husbandry financed by the Imperial Council of Agricultural Research is now in its third year. This work is being carried on at the Government Central Poultry Research Station, Kirkee, and at sub-stations at Vadala in the Ahmednagar district and at Ankleshwar in the Broach and Panch Mahals district. The investigations carried on during the period under report included feeding experiments, breeding and cross-breeding

for egg laying, and experimental work on the production of cheap poultry houses for use in the villages. In all these directions, considerable progress has been made. Particular attention has been given to the evolution of a new breed, viz., a cross between the Chittagong and Rhode Island Red stocks. The results so far obtained have been most promising. In connection with the experimental work, incubation records and complete costing accounts are being maintained.

Section IV.

Miscellaneous Research Work.

A. Cold Storage Research Scheme, Ganeshkhind.

(38) The year under report represents the fifth year of the Cold Storage Research Scheme, Ganeshkhind, which is financed by the Imperial Council of Agricultural Research. The Scheme has been extended up to the end of February 1940. During the period under report, cold storage trials of *mosambis* and *santras* from Aurangabad, apples from Chaubattia, peaches from Peshawar and pears from Kashmir were carried out and the experimental results furnished to the officers who supplied the material for trial. In addition, observations were made upon the respiration of the Alphonso mango under differing storage conditions and on the chilling and "browning" of the skin of the ripe fruit. Among vegetables, utilised for cold storage experiments, cabbages, onions, shelled peas and beet roots were included. Practically all the important fruits and vegetables produced in India have now been experimented with at the Station and their suitable cold storage temperatures ascertained and recorded.

B. Agricultural Engineering Research Work.

(39) During the year under report, the Agricultural Engineer continued his efforts to improve certain types of agricultural implements by means of further research work in the Agricultural Engineering Workshop. The main implements under investigation are :

1. Improved seed drills,
2. Soil scooper,
3. Winnowing fans,
4. Ball bearing cart wheels,
5. Groundnut digger.

With regard to improvements in seed drills, work is now mainly conducted towards the elimination of certain minor defects

which have become apparent in field trials. The main difficulty is to reduce the cost of the improved drill to such an extent that it will be within the means of the average cultivator. Possibly this will only be possible if the improved implements can be manufactured on a mass production basis. The main advantages of the improved drill evolved by the Agricultural Engineer are its automatic and uniform sowing, its reduced draft and possibility of easy adjustment for depth and seed rate, and the economy of seed resulting from its use. Twenty-three improved seed drills have so far been manufactured by the Agricultural Engineer and distributed to various applicants.

The soil scooper is an implement mainly intended for use under the Improved Dry Farming method evolved at Sholapur. Experience has shown that certain modifications on the original design are necessary and these are now being undertaken at the Agricultural Engineer's workshop.

The improved winnowing fan has become very popular with the cultivators and the demand for this implement is on the increase. All reports received from the districts indicate that the fan works very satisfactorily and certain suggestions have been made, particularly with regard to the adjustment of the fan to varying directions of the wind, which are being experimented upon by the Agricultural Engineer in order to improve the fan further.

The cart wheel fitted with ball bearings is now being popularised in the districts and further experimental work is mainly directed towards facilitating and cheapening the conversion of original cart wheels to the ball bearing type.

With reference to experimental work on the groundnut digger, three implements were built and sent to the districts for trial. It is apparent that, for stiff soils, a stronger machine will be necessary and the Agricultural Engineer is conducting further research work with this object in view. The improved groundnut diggers sent to Gokak and to Karad for trial were found to work very satisfactorily and the cultivators who attended the trials expressed their approval of the performance of the implements.

Section V.

Further Research Schemes.

(40) During the year under report, only one scheme, i.e., in connection with the formation of Milk Recording Societies was sanctioned by the Imperial Council of Agricultural Research.

The following schemes, already sanctioned in the last year, were started during the year under report :—

(1) Scheme for research work on *striga* attack on *jowar*.

(2) Bombay Plant Virus Disease Scheme.

(3) Scheme for investigation into the insect pests of sugarcane.

The undernoted schemes have already been sanctioned by the Imperial Council of Agricultural Research and will be commenced next year :—

(1) Scheme of research work on the cytology of *papaya*.

(2) Scheme for testing the reactions of wheats to black stem rust.

(3) Scheme for research work on gas storage of fruits.

(4) Scheme for the writing up of a monograph on dry-farming research work in India.

(5) Scheme for wool analysis.

One scheme has been approved by the Imperial Council of Agricultural Research but is still awaiting the allotment of finance, viz., Scheme for research in goat-breeding.

The undernoted schemes have been submitted to the Imperial Council of Agricultural Research but are still under consideration by that body :—

(1) Scheme of research work on grassland improvement.

(2) All-India crop forecast improvement scheme.

(41) During the year under report, the under-noted schemes financed by the Indian Central Cotton Committee were extended by that body for the periods mentioned against them :—

(1) Jarila Cotton Seed Multiplication and Distribution Scheme (3 years).

(2) Deccan Canals (Banilla) Cotton Seed Multiplication and Distribution Scheme (5 years).

(3) Surat Cotton Seed Multiplication and Distribution Scheme (1 year).

No new schemes were sanctioned by the Indian Central Cotton Committee during the year under report.

(42) No new schemes were sanctioned during the year by the Trustees of the Sir Sassoon David Trust Fund.

CHAPTER III.

AGRICULTURAL SERVICE AND PROPAGANDA.

(43). *Introduction.*—The main trend of development in agricultural service and propaganda, during the year under report, has been to associate still more closely non-official with official activities in these important aspects of rural development. In this connection, a Provincial Board of Rural Development has been established by Government and corresponding District Boards are being organised in each district of the Province. These Boards are largely non-official in composition and advise Government on all matters relating to rural development within their jurisdiction. With the re-organization of the Agricultural and Co-operative Departments, involving the establishment of a new Rural Development Department, the work of d strict demonstration and propaganda, organization of seed and implement supply, etc., has been removed from the Agricultural Department and entrusted to the new Department to be extended and intensified through co-operative agencies in the districts. Similarly, the new developments, mention d in the last year's report, relating to the establishment of Taluka Agricultural Demonstration Centres and to the appointment of Honorary Agricultural Agents in the districts now form part of the organisation of the Rural Development Department. The Agricultural Department, however, will remain closely associated with the work of agricultural propaganda and service through the Boards, mentioned above, and will continue to co-operate to the fullest extent in the preparation and execution of a well-planned and intensive programme of extension work which alone can render the labours of the agricultural expert and scientific research worker fruitful and of real value to the cultivators.

Section I.

Seed Supply.

(44) *Introduction.*—The successful creation of an improved crop variety by either crossing, acclimatization or selection can only grow into practical importance if the improved seed can be made available to every cultivator. This naturally needs an efficient organization for seed multiplication and distribution. In many countries, the work of seed multiplication

and distribution is undertaken by private agencies and individuals. In the absence of such concerns in India, this important task is entirely borne by Government. As a result of the activities of the Agricultural Department in the past, there is an ever-increasing demand by the cultivators for the seed of improved varieties of crops. Accordingly, there is a growing need for the establishment of official seed depots where pure and reliable seed will be made available to the agriculturists. In future, this work will be entrusted to the newly established Rural Development Department which will be supplied with pure seed from Government Farms and Research Stations and which will organise its multiplication and distribution on a large scale in the districts. One reliable method of intensifying this work would be the establishment of Seed Supply Societies which will have their own seed growers from among their members and who will be supplied year by year with pure improved seed to be grown under technical supervision and handed over to the Society for further extension. Any organisation for seed multiplication and distribution, to be successful, must have the co-operation of the cultivators themselves, at least in the later stages of multiplication and extension.

(45) *Seed supply—Cotton.*—During the year under report, five organized seed distribution schemes for improved varieties of cotton were in force in the Province. These schemes are centred at Surat, Broach, Dharwar, Jalgaon and Kopargaon and deal with the multiplication and extension of the improved varieties of cotton, viz., 1027 A.L.F., B.D.8., Jayawant and Gadag No. 1, Jarila and Banilla, respectively. The schemes continue to receive financial assistance from the Indian Central Cotton Committee.

(46) (*a*) *Surat Seed Distribution and Extension Scheme.*—The object of this scheme is the distribution and extension of the seed of the improved cotton variety 1027 A.L.F. so as, ultimately, to cover the whole of the Surat district with this better variety. The area controlled during the year was 11,736 acres which included 865 acres grown from Surat Farm pedigree seed. The total quantity of *kapas* of 1027 A.L.F. cotton ginned was 5,611 *bhars* giving 2,242 *khandies* of lint. Seed production amounted to 2,174,217 lbs. and, of this stock, 678,572 lbs. were supplied to Rajpipla State and other outside indents. The remaining quantity was distributed in the district where 24 depots were opened for this purpose. Nearly 99,416 lbs. were supplied direct to the Hansot Co-operative

Cotton Sale Society. Thus, the total seed distribution of improved 1027 A.L.F., through departmental agency, was 2,273,633 lbs.

The Cotton Transport Act of 1923 has now been amended so as to restrict, from the year 1940, the transport of *kapas* and cotton seed from the Olpad taluka and part of the Chorasi taluka, north of the Tapti, into Surat area. Half pressed bales will be allowed to be brought to Surat under license for full pressing. This measure, together with the increase in the import duty on imported cottons, has stimulated the demand for stapled cotton and has benefitted the work of extension of the better quality cotton 1027 A.L.F. in Surat district. As a result of the passing of the Cotton Control Act of 1925, Goghari cotton cultivation has now been completely eliminated but its place has been taken to some extent by the inferior quality selection I. D. cotton, where Goghari was previously grown. However, conditions appear now to be more favourable than for some time past for the rapid spread of 1027 A.L.F. in Surat district.

(47) (*b*) *B. D. 8 Seed Distribution and Extension Scheme.*—This scheme aims at the distribution and extension of the high yielding and wilt resistant strain of improved B. D. 8 cotton in the Broach and Panch Mahals district. During the year under report, 289,420 lbs. of seed were purchased from the produce of the controlled area of 7,096 acres (536 acres and 6,651 acres under inner and outer reserved area, respectively) for distribution for sowing in 1939–40. In addition, 4,800 lbs. of Farm seed were supplied to group and society growers for further multiplication. 166,120 lbs. of B. D. 8 seed were supplied to cultivators of Kaira and Panch Mahals, including Baroda State territories. In all, 10,208 F. P. bales of B. D. 8 lint were produced of which 3,254 bales from groups and societies were sold at a premium of Rs. 39 to Rs. 53 over current Broach quotations and 6,954 bales were disposed of by gin-owners at a premium of Rs. 30 to Rs. 43. Accordingly, the cultivators are appreciative of the improved variety. Moreover, *kapas* purchases of B.D. 8 were readily made at a premium of Rs. 2 to Rs. 4 per *bhar* of 1,020 lbs.

(48) (*c*) *Revised Jayawant and Gadag No. 1 Seed Distribution and Extension Scheme, Southern Division.*—The revised seed multiplication scheme for the extension of these two improved varieties of cotton in the Southern Maratha Country

completed its third year during the year under report. Work continued on similar lines as in previous years at seven centres for Jayawant cotton and two centres for Gadag No. 1 cotton. Reserved areas for the production of pure seed were organised, viz., 66,163 acres for Jayawant in the Dharwar and Bijapur districts and 23,156 acres for Gadag No. 1 in the Dharwar district. These reserved areas contained the crops of four generations. 62,185 acres of Jayawant and 23,482 acres of Gadag No. 1 were rogued at an average cost of slightly over 4 pies per acre. In all, 4,544,198 lbs. of seed of Jayawant and 1,618,205 lbs. of Gadag No. 1 cottons were stocked and 3,138,154 lbs. of Jayawant and 1,129,540 lbs. of Gadag No. 1 seed were distributed. These quantities were sufficient to sow 324,197 acres and 112,944 acres, respectively, which represent a considerable increase on last year's figures. Reserved area *kapas* was collected, pooled, graded and sold by auction through sale societies and departmental agents. Forty-nine auction sales were held and were much appreciated by the cotton-growers as such method of disposal of the crop gave the cultivators an extra premium of Rs. 3–10–0, in different centres, for Jayawant and Rs. 9 for Gadag No. 1 over the current market rates for the ungraded local crops. The total pedigree seed of the second to sixth generation stocked for distribution in 1939–40 is 4,477,986 lbs. of Jayawant and 1,066,865 lbs. of Gadag No. 1.

(49) (*d*) *Jarila Seed Distribution and Extension Scheme, Khandesh.*—Under this scheme, 98,480 lbs. of pure Jarila seed were distributed during the year under report. The total area covered by the improved variety was 4,980 acres in both the East and West Khandesh districts and in the Malegaon taluka of Nasik district. In addition, the area of natural spread is estimated to be about 5,000 acres. Over five lakh lbs. of Jarila cotton seed have been stocked for distribution in the year 1939–40.

Attempts are being made to extend the cultivation of 1027 A.L.F. cotton in the Nandurbar taluka and Nawapur peta of the Khandesh district and 11,120 lbs. of the seed of this improved variety were distributed during the year. Natural spread is also on the increase.

(50) (*e*) *Banilla Seed Distribution and Extension Scheme, Deccan Canals.*—This seed extension scheme for the introduction and spread of the improved Banilla variety of cotton in the Deccan Canals tract is in its fifth year. The season was

extremely unfavourable for cotton cultivation and, at Kopergaon Farm, where the Banilla cotton crop occupied an area of 51 acres, the average yield of seed cotton was low. In addition, the germination of the seed produced has been found to be defective. The system of working the scheme through tenant farmers has not proved successful and the reorganization of the work on a different basis is under consideration. The total yield of pure Banilla seed amounted to about 12,000 lbs. which will be distributed for sowing next season.

(51) *Seed supply—Other crops.*—In the year under report, as in previous years, the multiplication and distribution of the seed of improved varieties of all crops, in addition to cotton, was carried on by departmental agencies assisted, in some areas, by co-operative organizations. In future, under the recent reorganization scheme, such work will be entrusted to the Rural Development Department, the Agricultural Department continuing to provide the nuclei of pure seed of all types of crops produced on Government Farms and Research Stations.

North-Central Division.—The distribution of the improved Akola *bajri* variety is making considerable headway in the West Khandesh and Nasik districts and 12 seed farms have been organised which, in the year under report, distributed about 20,000 lbs. of seed to 21 seed-growers. Similar work is being undertaken to extend the cultivation of the improved Maldandi and Nialo *jowar* types. Rice seed distribution was confined to the improved kolumba varieties, viz., No. 42, No. 184 and No. 226, several thousand lbs. of the seed of which were distributed to rice-growers in the Thana and Kolaba districts. Appreciable quantities of lucerne and vegetable seeds were also distributed through departmental agency. Much progress was made in this division in the extension of fruit cultivation and large numbers of budded plants and grafts were supplied to cultivators through Taluka Development Associations. In Dhulia taluka, 5049 citrus plants, 449 mango grafts and 1333 grafts of other fruit trees were distributed and similar work on a like scale was done in the Nasik, East Khandesh, Thana and Kolaba districts.

Southern Division.—Over 2,70,000 lbs. of improved paddy varieties were distributed through departmental agency in addition to the large quantities of improved cotton seed mentioned in another portion of this Report. 6,08,000 sets of improved cane varieties and 32,844 budded and grafted fruit

trees, etc., were also made available to the public. In addition, large quantities of pine-apple suckers were issued from the Kumpta and Ratnagiri Farms as there is an ever-growing demand for such material in the vicinity of these farms.

Gujarat.—21,947 lbs. of Budh Perio No. 53 *jowar* seed, an improved high-yielding variety, was distributed from the produce obtained on the Surat Farm. In the Ahmedabad district, 32,580 lbs. of sann hemp seed, 19,280 lbs. of improved wheat seed, i.e., Pusa 52 and No. 224 and considerable quantities of improved *bajri* variety No. 207 and of Magdi and spanish peanut were distributed through departmental agency. In the Kaira district, large quantities of improved fruit tree stock were made available to the public and, in addition, seed of improved wheat and *bajri* strains and of sann hemp were distributed. Similar work made progress in other Gujarat districts. In the Surat district, 40,000 sets of the improved cane varieties, P. O. J. 2878 and Co. 419, were distributed to cane-growers.

South-Central Division.—The distribution of the seed of improved varieties of crops, other than cotton, was continued during the year, the main crops being improved *jowars* (63,687 lbs.), improved wheats (78,214 lbs.), Akola *bajri* (30,218 lbs.) and improved rices (1,54,630 lbs.). In the Deccan Canals tract, 12,94,200 sets of improved sugarcane varieties were made available to irrigators. Potato seed distribution was continued in the Poona district.

Section II.

Livestock Work.

(52) *Introduction.*—The considerable increase of public interest in the work of livestock improvement in the Province, which was noted in the last year's Report, was considerably intensified during the present year. Much impetus has been given to this branch of the activity of the Agricultural Department by the interest taken by His Excellency the Viceroy in the welfare of the cattle population, which assumed a practical shape in His Excellency's "Gift Bull Scheme". Simultaneously, much more consideration is being given to the extension and improvement of grass-lands, grazing areas and fodder production and all matters dealing with these important subjects are fully discussed by the Provincial Fodder and Grazing Committee, the establishment of which was noted in the last year's Report.

(53) *Premium Bulls.*—The main work of the livestock section of the Agricultural Department in the Province continues to be the rearing, selection and distribution of premium bulls in the selected cattle breeding tracts of the Province. On the 1st of July 1939, 278 premium bulls were stationed at different centres in the cattle breeding tracts as compared with 193 on the 1st of July 1938. This work forms a very valuable contribution to the general improvement of cattle throughout the Province.

(54) *His Excellency the Viceroy's Gift Bull Scheme.*—During the year under report, 38 " Gift Bulls " were made available under the above scheme by the livestock section. The difficulty of obtaining suitable cultivators to maintain these Gift Bulls continues to be felt and several complaints were received regarding the supposed failure of these bulls in breeding. On investigation it was largely found that in majority of cases the bulls were neglected and under-fed having been placed in unsuitable villages and with unsuitable agents. The cause of this trouble mainly arises from the necessity of observing donor's wishes in situating such bulls in the district. Improvement will only be effected with the centralisation of all livestock improvement work under the Livestock Expert to Government.

(55) *Scheme for Buffalo Breeding and Improvement.*—The scheme for the improvement of the milch buffalo was continued and, in all divisions of the Province, buffaloes were tested for milk yield in selected villages. The progeny of the highest yielders are being ear-marked for breeding purposes. In addition, young male pedigree buffaloes from the Agricultural College Dairy, Kirkee, are being supplied free of charge to cultivators in Gujarat for breeding purposes.

(56) *Improvement of Village Poultry.*—Work in the direction of the improvement of poultry in the villages continues to make satisfactory progress. During the year, 270 pedigree cockerels were distributed in various districts and over 90 villages have been concentrated on for poultry improvement work. In addition, a scheme for the encouragement of pedigree poultry keeping in villages by the grant of premia to poultry keepers who undertake to maintain poultry farms on up-to-date lines has been commenced. Eight poultry farms were awarded special premia during the year under report. Other poultry improvement schemes are being financed from village improvement grants in different tracts of the Province.

(57) *Egg Marketing Scheme, Belgaum.*—This scheme aims at the co-operative marketing of graded eggs and is financed by the Sir Sassoon David Trust Fund. It was commenced in November 1938 under the guidance of Rao Saheb V. V. Shirgaonkar, B.Ag., and about 21,350 eggs were handled during the period ending 30th June 1939.

(58) *Co-operation with Panjrapols, Gowrakshaks, etc., in cattle improvement.*—A close co-operation between the Livestock Expert to Government and the authorities of the Bombay Gowrakshak Mandali was continued and intensified during the year. The Mandali celebrated its Golden Jubilee on 23rd January 1939 when a large Cattle Show was organised at Kandivli and opened by His Excellency the Viceroy, Lord Linlithgow. This institution is the only source of pure-bred Gir stock for issue for breeding purposes in the districts. The Livestock Expert to Government is negotiating with other Panjrapols and Gowshalas with the object of enlisting their co-operation also in intensifying livestock improvement work.

(59) *Advisory work.*—Enquiries regarding cattle, dairying, sheep and poultry are on the increase. The Livestock Expert is frequently asked by District Village Improvement Committees and private organisations and individuals for technical advice and assistance in animal husbandry matters. Such applications are always dealt with fully and promptly.

(60) *Shows and Cattle Rallies.*—In order to stimulate real interest among cattle breeders, healthy competition is created by the organisation of local cattle shows in the main cattle breeding areas. At such shows substantial prizes are awarded and advice and assistance given to cattle breeders. During the year, thirteen cattle shows and eight cattle rallies were held, the most important of which took place at Kandivli and Pandharpur. 48 selected animals were sent from the Province to the second All-India Cattle Show, held at Delhi in February 1939. This stock won 1,400 rupees in cash prizes and in addition secured numerous class medals and cups.

(61) *Livestock Improvement Act of 1933.*—This Act has now been applied to 47 villages in the Province and during the year 23 villages in the Ahmedabad district and 7 villages in the East Khandesh district have been recommended for the application of the Act with the approval of the respective District Local Boards. In villages where the Act has been applied, castration of scrub bulls is proceeding regularly.

(62) *Propaganda in storage and cultivation of fodder.*—Under the Livestock Expert to Government, silage making demonstrations were carried on in seven villages and encouragement and assistance were given to cultivators in the introduction of improved fodder crops. Experimental work on the cultivation of dry Napier grass has also been commenced.

(63) *Formation of Milk Recording Societies.*—In all countries of the world, where pedigree registration and milk recording have been introduced, such steps have been proved to be of much influence in the betterment of livestock. During the year under report, the Imperial Council of Agricultural Research sanctioned a scheme for the introduction of milk recording in this Province. Work under the scheme has been commenced in six villages of the Sanand taluka of the Ahmedabad district which is in the centre of one of the main cattle improvement tracts under the Premium Bull System.

Section III.

Crop Protection.

(*a*) *Against Wild Animals.*

(64) The shikar work organised by the Agricultural Department, and, in particular, the gun-club movement is becoming increasingly popular and is spreading in the tracts where such work was commenced by the shikar staff. Special mention must be made of the campaign against nilgai carried on in Gujarat, during the year under report, which proved successful in spite of the orthodoxy of the people and their aversion to taking animal life. During the year under report, 1294 wild pigs and 526 nilgais were killed by the shikar organizations in the Province.

(65) In the Kaira district, crop protection work against wild animals was concentrated in the Nadiad, Anand and Borsad talukas under gun-club groups or Taluka Development Associations. Assistance was given from village improvement grants and contributions were made by cultivators. Two professional shikaris were engaged and, during the period from November to May, 490 nilgais and 375 wild pigs were destroyed. An attempt to use snares was unsuccessful as the animals were too disturbed by the hunting parties.

Two more gun-clubs were organised at Kandhari and Dhumwad in the Jalgaon taluka of the East Khandesh district and the two clubs, previously established in the Bhusawal taluka continued their work. 328 wild pigs and 36 nilgais were killed in this area.

In the Satara district, the preliminary organization of six gun-clubs was completed and clubs already established held periodic hunts during the season.

(66) In the Southern Division, the established gun-clubs continued to work well and accounted for numerous wild pigs through orgar ised hunting parties. Six more gun-clubs were organised in the year under report, bringing the total for the division to 26. In all, 567 wild pigs were slaughtered and numerous others scared away from the cultivated areas. Over 90,000 acres of crops were protected by the shikar organisations and much night-watching by the cultivators was rendered unnecessary. Applications for assistance in starting new gun-clubs in this division are being received by the Shikar Officer and are being responded to promptly.

(67) Under the reorgar ization scheme, the shikar work will in future be entrusted to the Rural Development Department.

(*b*) *Against Plant Diseases and Fungi.*

(68) During the year under report, an Insect Pest and Plant Disease Committee, with the Director of Agriculture as Chairman and the Plant Pathologist to Government and the Professor of Entomology as members, was established by Government. This Committee considers all matters relating to the attack of insect pests or the occurrence of plant diseases on crops and orchards and co-ordinates the work of prevention and control measures. Ten meetings of the Committee were held during the period under report and a large number of subjects were dealt with at these meetings. The Plant Pathologist to Government is the Secretary of the Committee.

(69) Research work on the control of plant diseases and on fungi is carried out at the College of Agriculture, Poona, under the Plant Pathologist to Government. During the year under report, considerable progress was made in research work on numerous plant diseases and fungoid attack on many important crops. Special interest is attached to the work which is being carried out at Sirsi by the Assistant Plant

Pathologist in investigations into the "*koleroga*" disease of the areca-nut palm. Many doubtful points in the life-history of the causative fungus have been cleared up, thus indicating the possibility of simpler and more effective control methods. The elimination of the sources of infection from betelnut gardens in Kanara before the onset of the monsoon—which recent scientific work indicates to be possible—is likely to have far-reaching effects on the control of this serious disease.

(70) In his investigations into the breeding of wilt resistant cottons, under the Cotton Wilt Breeding Scheme, Gujarat and Khandesh, the Plant Pathologist to Government has obtained most promising results on the production of 100 per cent. wilt-resistant types of cotton for Broach area. These resistant types have been isolated from the cross (B.D. 8 × S. 7-1) and the Broach back-cross (B.D. 8 × G.A.26) × B.D. 8, and B.D. 8. Similar results have been obtained in some of the *Gossypium arboreum* var. *neglectum* cottons, which are now being used as parents in crosses with Jarila and N.R. 5 with the object of obtaining a 100 per cent. wilt resistant type of cotton possessing the staple of Jarila and other desirable economic characters for extension in the Khandesh tract.

(71) Investigations into the serious disease known as "damping-off" in tobacco seed-beds have proved that this disease can be readily controlled by applications of "Cheshunt" compound at small cost to the tobacco-growers. In addition, scientific work has been carried out on the *fusarium* wilt of sann hemp and multiplication of immune varieties, obtained as a result of previous investigations by the Plant Pathologist, is in progress. Study of the *fusarium* causing wilt in *Lathyrus sativus* a so made good progress and selection of wilt-resistant types is proceeding successfully.

(72) Among other plant diseases, etc., upon which attention was given during the year, may be mentioned fig "rust", twig blight and fruit rot of mango, soft rot of ginger, mottle-leaf of *mosambi*, Panama disease of bananas and powdery mildew of betel-vine. In some cases, control measures have already been obtained and are under trial in the districts. Preliminary work in connection with the Bombay Virus Diseases Scheme, financed by the Imperial Council of Agricultural Research, was completed during the year under report.

(73) The work on *striga* on *jowar* and *orobanche* on tobacco, which is under the direction of the Economic Botanist to Government and which aims at obtaining *jowar* and tobacco strains resistant to these respective parasites, was carried a stage further during the year. Preparations for more intensive work on research into the *striga* parasite of the *jowar* crop, which is being financed by the Imperial Council of Agricultural Research, were concluded. Selections of *striga*-resistant *jowars* from the varieties "Bolichigan" and "Mudd nandyal", giving 90 per cent. resistant plants, have been obtained and experimental work on other varieties is in progress. Botanical selection has not proved effective in obtaining types of tobacco plants resistant to *orobanche* and it is proposed now to make crosses between various suitable varieties to evolve resistant types.

(74) The extensive work to encourage the wide adoption of the control measures against *kcleroga* disease on betelnut palms in the Southern Division, by spraying with Bordeaux mixtures, was continued during the year under report. Forty-two village centres, dealing with two hundred and two villages, were established, each in charge of a temporary kamgar and equipped with sprayers, spare parts and stock of chemicals. Unfortunately, long periods of continued rainfall interfered seriously with the progress of the work but an area of 2,663 acres was sprayed as against an estimated programme of 5,050 acres. The bulk of the sprayed area of gardens was in the Siddapur taluka. On the other hand, the rainfall conditions were also unfavourable to the spread of the disease, especially in the early months, i.e., August and September. In October, however, the infection became much more severe causing considerable loss in certain areas, particularly on the untreated gardens. Prejudices against the use of the control measures, which are quite unfounded on fact, continue and much more propaganda is needed to induce all garden-owners to adopt the measures advocated by the Department. If propaganda is not successful, legislation to enforce spraying would be desirable as the presence of unsprayed gardens nullifies any chance of controlling the disease effectively.

(c) *Against Insect Pests.*

(75) Research work on the control of insect pests on cultivated crops, orchards, etc., is carried on by the Professor of Entomology, College of Agriculture, Poona. The extension of proved preventive and control measures is done by the

territorial Deputy Directors of Agriculture and their district staffs but, in future, will be entrusted to the Rural Development Department. The establishment of the Insect Pest and Plant Disease Committee, mentioned above, has added considerable impetus to this branch of the departmental activities.

(76) During the year under report, a very comprehensive and successful campaign against the grasshopper pest on sugarcane in the Deccan Canals tract was started with the assistance of a grant from the Sugar Excise Fund placed at the disposal of the Provincial Government by the Government of India. A series of stations have been established in the Canal area where the materials required for control of the pest have been stocked and an adequate staff of kamgars provided to put control measures into effect as soon as emergence of the pest from the soil takes place. In addition, intensive propaganda has been done to induce cultivators to plough up areas affected by the pest last season and thus to reduce emergence by destroying the egg-masses on the soil. The life history of the pest has been fully worked out by the Professor of Entomology and the campaign, which is still in progress, promises to result in unqualified success in controlling this serious pest on sugarcane.

(77) Research work on insect pests of crops was carried on, particular attention being given to the control of aphis on peas and cabbage by the use of tobacco waste extract, trials of cyanogas and sulphur on mango hoppers, control of the betelvine bug, control of hoppers on fig trees, study of fruit flies and trials of insecticides. The results of such work have shown that, in most cases, simple and economic methods of control are possible and these are now being worked out in detail and tested under district conditions.

(78) The propaganda work under the Cotton Boll-worm Control Scheme, which aims at bringing home to the cultivators the advantages of uprooting cotton stalks immediately after harvest as a control measure against boll-worm attack, completed its sixth year. Work was concentrated in three talukas, viz., Chorashi, Olpad and Ankleshwar, and 1,552 plant-pullers were sold at Rs. 1-4-0 (iron handle) and annas 12 (wooden handle). These sales were subsidized by the grant from the Indian Central Cotton Committee. Legislation to enforce the uprooting of cotton stalks over the whole area before a certain date is now necessary and would be most effective in reducing the pest and increasing cotton yields per acre in Gujarat.

Section IV.

Publicity.

(79) *Introduction.*—The important task of introducing and extending the results of successful research work into general agricultural practice and of educating the cultivators to adopt improved methods and materials of agriculture has been carried on by the district staff of the Agricultural Department. In future, this task will be undertaken by the newly formed Rural Development Department. The main essentials in future development of district "extension" work are still in close contact with the individual cultivator and sympathetic study of his agricultural problems, the organization of the primary producers to enable them co-operatively to take advantage of agricultural improvements in crops, implements and cultural methods which, individually, they might find difficulty in adopting successfully and the closest co-operation between officials and non-officials in all measures designed to advance the welfare of the rural community upon which the future prosperity of the Province is so vitally dependent.

(80) *Demonstrations.*—In all divisions of the Province, the district staff of the Agricultural Department organized and carried out practical demonstrations of improved agricultural methods and materials on the fields of numerous cultivators and on Taluka Agricultural Demonstration Centres. Such demonstrations were generally accompanied by illustrative lectures and talks. In the North-Central Division, over 1,200 such field demonstrations were held during the year. In the South-Central Division, demonstrations were held regularly on Taluka Agricultural Demonstration Centres and were invariably well-attended by cultivators. Over 1,000 such field demonstations were carried out in this division. In the Southern Division, similar work was carried out by the departmental district staff at about 350 centres—field plots and Taluka Agricultural Demonstration Centres. In addition, several local training classes in bunding, horticulture, sugar-making, etc., were held. In the Gujarat Division, parties of cultivators were taken periodically to the Taluka Agricultural Demonstration Centres where they were shown and instructed regarding the improvements which had been put into force on these selected plots. Similar demonstrations were organised at the cotton breeding stations at Broach and at Government

Farms. In the Broach and Panch Mahals district alone, 93 such demonstrations were held at which numerous items of agricultural improvement were shown to the visitors.

(81) *Shows.*—No Divisional Agricultural Show was organised by the Agricultural Department during the year under report but agricultural sections were organised by departmental agency at large shows and exhibitions at Poona and Surat.

(82) *Miscellaneous.*—The members of the staff of the Agricultural Department contributed numerous articles dealing with subjects of local agricultural importance to numerous papers and publications in the districts. In addition, the services of the district staff was frequently taken advantage of by official and non-official agencies in arranging lectures, etc., at public meetings and gatherings of cultivators.

Section V.

Rural Uplift.

(83) During the year under report, the Agricultural Department co-operated to the fullest extent with the officers of the Revenue Department in the districts and with Village Improvement Committees in the initiation, organization and supervision of various schemes designed for rural uplift and village improvement.

(84) In the North-Central Division, this co-operation was mainly directed towards the organization of the distribution of seed of improved varieties of crops, including the improved wheat variety No. 224 and sann hemp seed for green manuring. In addition, technical advice and assistance was given in the bunding of about 3,000 acres of land to prevent soil erosion. In the Palghar area, malis, provided from village improvement grants, visited thirty villages and assisted the cultivators to establish mango plantations and to grow cashew and jack-fruit trees on *varkhas* lands. At Wada and Bordi, 11,200 lbs. of improved paddy seed were distributed and 30 silo pits were prepared and filled. In the Kolaba area, work towards the development of Patalganga, Kudalika and Ulhas valleys is in progress and large quantities of good quality fruit-tree stock have been distributed. In the South-Central Division, similar assistance and technical advice was freely given to Village Improvement Committees. Details of similar work done in other divisions will be found in the reports of the Deputy Directors of Agriculture concerned.

(85) In Gujarat, the Jhalod agricultural scheme, financed from village uplift funds, was continued during the year. The main items of work were the use of improved implements, remedial measures against field rats, bunding and levelling and the supply of seed of improved crop varieties and of superior fruit-tree stock. In the Surat district, the Agricultural Department organised the agricultural section of the Second Trades and Agricultural Exhibition which included stalls for horticulture, improved seeds, manures, insecticides, land development, marketing and improved implements. Practical demonstrations of improved agricultural methods were held in co-operation with village improvement committees.

Section VI.

Miscellaneous.

(1) *Agricultural Marketing.*

(86) (*a*) *All-India Marketing Investigation.*—During the year under report, the work in the Province in connection with the All-India agricultural produce marketing investigation was in charge of the Professor of Agricultural Economics, College of Agriculture, Poona. With regard to marketing surveys, the preliminary reports on wool and hair and on cocoanuts were submitted and detailed notes on the marketing of jute products, fibre crops (except cotton), myrabollans and lac were prepared. The surveys on the marketing of sugar and *gul*, sheep and goats, fish, lac, mangoes, apples, pine apples and cashew-nuts were continued. In addition, much work was done in connection with the collection of supplementary information relating to survey reports, previously submitted to the Marketing Adviser to the Government of India. Developmental work was mainly directed towards the preparation of proposals, etc., for the regulation of markets, fixation of standard grades, grading experiments, issue of authorisation certificates, publicity work and price intelligence services.

(*b*) *Cotton Marketing.*—Continued progress was made in the establishment of regulated cotton markets throughout the main cotton growing tracts of the Province. In the North-Central Division, there are now four such regulated markets at Dhulia, Amalner, Jalgaon and Dondaicha. At the Dhulia

market, the arrivals totalled 48,000 carts. In the Southern Maratha Country, the regulated cotton markets at Bailhongal and Bijapur continued their works and efforts are being made to establish similar marketing organizations at Gadag, Hubli, and Nargund. In Gujarat, preliminary propaganda was conducted by magic lantern lectures in 23 villages to convince cotton-growers of the advantages of regulated cotton markets. The establishment of such a market at Broach is being undertaken next year.

(2) *Agricultural Engineering.*

(87) (*a*) *Agricultural Engineering Services.*—The Agricultural Engineer dealt with 253 enquiries for technical advice and assistance during the year under report, of these, 83 were in connection with pumping, 50 with boring operations, 11 with tractor ploughing, 22 with hire of mechanical plants, 54 with repairs to machinery and the remainder with miscellaneous subjects. Thirty-four pumping sites were surveyed and 60 estimates for power plants were supplied to applicants. Eighty-two drawings and sketches were prepared and the erection of new plants, or modifications or re-erections of old plants were executed at 27 centres. The district mechanical staff inspected 111 power plants in the course of their routine duties. In addition, the Agricultural Engineer was very fully occupied with constructional work for other sections of the Department, including the erection of glass houses, etc., for the Plant Pathologist to Government in connection with the Plant Virus Disease Research Scheme, construction of quarters for 100 students at the Ganeshkhind Fruit Experiment Station and for 40 students at the Government Poultry Research Station, erection of buildings for the Bee Expert, purchase of tools, machinery fencing, etc., for the new vocational schools at Godhra and Bijapur and miscellaneous other minor items. Much of this construction work was of a specialized and unusual nature and required considerable thought and time to complete satisfactorily.

(88) (*b*) *Tractor ploughing against hariali in the Southern Division.*—In the year under report, a private company, viz., the Hubli Tractor Ploughing Company, unedertook tractor ploughing against *hariali*. Over 600 acres of cultivators' lands were ploughed in three months. This work will require to be greatly extended and an adequate organization for repair work and spares is essential.

(3) *Poona Agricultural College—Services rendered by Heads of Sections in expert advice, etc.*

(89) As usual, there was a considerable demand from the public and other departments of Government for expert advice and assistance from the expert scientific officers in charge of sections at the Agricultural College, Poona, During the year under report, the Professor of Agriculture dealt with very numerous enquiries relating to cultivation, tillage implements seed supply, manures, dairying, etc. The College Dairy afforded services of pedigree male stock to 40 cows and 15 buffaloes belonging to the public. The Horticulturist to Government replied to 1,101 references from enquiries on horticultural matters and he and his staff carried out numerous inspections of gardens and orchards in the districts and gave advice and assistance to the owners. Nine horticultural training classes were held and horticultural stalls were organised at seven district agricultural shows. The Economic Botanist to Government continued his work of collection and identification of specimens during the year and dealt with 287 specimens. He also replied to 81 technical enquiries some of which required lengthy explanations. Collections of seeds of grasses and economic plants were made for correspondents in Russia, Aden and Australia. The Agricultural Chemist received 673 samples for analysis, 318 of which were soils, 19 waters, 53 manures, 34 feeding stuffs and 22 seeds and grains. He also co-operated with the Agricultural Meteorologist in a series of soil samplings in connection with an experiment on the seasonal fluctuations of soil nitrogen. The Professor of Entomology replied to 527 enquiries regarding insect pests and conducted numerous trials of insecticides. In addition to his usual duties, the Plant Pathologist to Government was Secretary of the Insect Pest and Plant Disease Committee.

(4) *Prevention of Soil Erosion.*

(90) In many districts, the anti-erosion campaign was carried out intensively, mainly by means of actual anti-erosion, i.e., bunding schemes on cultivators' lands and by the organization of district bunding classes. In the North-Central Division, over 10,000 acres of cultivators' lands were bunded scientifically and training classes of 50 cultivators each were held at three centres. In the Southern Maratha Country, many bunding classes, eleven in all, were held and the Bunding Officer prepared 25 schemes involving 738 acres for private

cultivators. 589 students from the cultivating classes received practical instruction in modern bunding methods and in the preparation of anti-erosion schemes. Similar classes were held in the Gujarat Division and in the South-Central Division where numerous applications are being received from cultivators for advice and assistance in the protection of their lands from erosion.

(5) *Miscellaneous.*

(91) Considerable propaganda work was done in many areas to encourage and instruct cultivators in various items of agricultural improvement. For instance, in the North-Central Division, 291 model pits for manure storage on correct lines were constructed in Malegaon and Nasik sections and 323 pits in Dhulia section. The preparation of compost manure was also demonstrated at numerous centres, and is now being undertaken by the cultivators themselves in accordance with departmental instructions. In all divisions, the distribution of improved implements was continued through departmental agency, but such work is gradually being taken over by private individuals and firms. Classes for Honorary Agricultural Agents were held at many centres in the district and continued attention was given to the management and development of Taluka Agricultural Demonstration Centres, the establishment of which as propaganda centres was noted in the last year's report. The total number of such centres in the Province are now 49, 14 in the North-Central Division, 14 in the South-Central Division, 10 in Gujarat and 11 in the Southern Division. The distribution of manures, both organic and inorganic, was continued on a large scale and over 800,000 lbs. of chemical fertilisers and oil-cakes were disposed of by departmental agency in the Southern Division.

CHAPTER IV.

AGRICULTURAL EDUCATION.

(92) *The College of Agriculture, Poona.*—The Poona Agricultural College is the only institution in the Province devoted to higher agricultural education. In addition to their teaching duties, the staff of the College carry out considerable important scientific research work and are available for the supply of expert advice to agriculturists on problems relating to agriculture and allied subjects. The year under report was the 31st year since the establishment of the College. During the year, 173 students attended the College in the first term and 187 in the second term.

During the year, steps were taken to intensify the practical training in agriculture given to students in the new B.Sc. (Agri.) course. A scheme to extend the period of the terms of the College by six weeks was proposed and has been accepted by the Bombay University and it is expected that the College session of 1940 will begin on the 1st May instead of the 10th June, as formerly. The additional time, thus made available, will mainly be devoted to practical training in agriculture. In addition, however, readjustment of the teaching courses is being given effect to with the object of increasing still further the facilities and time for practical instruction in agriculture, including animal husbandry and dairying.

As in previous years, a Revenue Officers' Agricultural Course was held at the College for 10 days in September and was attended by seven Assistant and Deputy Collectors deputed by the Revenue Department.

A Forest Rangers' course of two years' duration has been carried on at the College since June 1938. At present, the course is attended by eight students, six of whom have been selected by Government and two deputed from the Indian States of Sawantwadi and Janjira.

Special courses in agriculture, plant pathology and chemistry were held and attended by six students.

The research and advisory activities of the expert staff of the Agricultural College are dealt with in the chapters of the Report dealing with these subjects.

(93) *Marathi and Kannada Agricultural Schools.*—The Marathi Agricultural School at Dhulia and the Kannada Agricultural School at Devi-hosur remained under the control

of the Agricultural Department during the year under report. The work done at these schools continued to be satisfactory and there is no doubt that they fill a definite want in the districts where they have been established. The Marathi Agricultural School, Dhulia, has now completed its 16th year and the present strength of students is 33. For admission in the first year, 83 applications were received of which 19 were selected. The School provides general instruction in agriculture on practical lines and, in addition, training is given in fruit, vegetable and flower growing, carpentry, smithy-work and weaving, poultry keeping and the management and working of oil-engines. The management of the School is vested in a local Agricultural School Committee which deserves much credit for its continued interest in the welfare of the institution and students. The Kannada Agricultural School, Devihosur, was attended by 28 students during the year, mostly from the Dharwar and Bijapur districts. It is interesting to note that 287 boys, trained in agriculture, have now been sent out from this school with certificates.

(94) *Agricultural Bias Classes.*—There are no important developments to report with regard to the agricultural bias classes during the year. These classes are under the control of the Educational Department and only the periodic inspections of the pupils are carried out by the technical staff of the Agricultural Department. This arrangement is being reviewed by the Director of Public Instruction but it appears to be essential that an adequately trained technical officer should be placed in general charge of the supervision of such classes if they are to fulfil satisfactorily the objects for which they were originally established.

(95) *Miscellaneous.*—During the year under report, special courses were organised in poultry-farming, horticulture, field bunding and anti-erosion measures and in the mangement and care of oil-engines. The poultry-farming course was held under the Livestock Expert to Government at the Government Central Poultry Farm, Kirkee, and was attended by 57 students from practically all over the Province. A similar course in horticulture, held at the Ganeshkhind Fruit. Experiment Station, attracted 60 students. In addition, special district courses in these two subjects were organised at different centres of the Province. As part of a wide-spread effort to increase the measures taken against soil-erosion in the districts, an advanced course in bunding was held at the Agricultural College under the Professor of Agricultural Engineering. 45 students

attended this course which aimed at providing those under instruction with sufficient training and experience to enable them to take part in the instruction of other cultivators in measures to be taken against soil erosion and to assist in district training classes on this subject. A class in the erection, management and running of oil-engines was held, as usual, at the work-shop of the Agricultural Engineer and was attended by 13 cultivator students.

CHAPTER V.

ADMINISTRATION AND FINANCE.

(96) *Introduction.*—The most important event of the year, relating to the administration and work of the Agricultural Department, was the decision of Government to establish a new Rural Development Department under the control of the Registrar, Co-operative Societies, and to transfer to this new organization all the district propaganda and demonstration activities, formerly conducted by the Agricultural Department. This change was given effect to from the 15th April, 1939. As a result, the Agricultural Department will, in future, concentrate its energies on scientific research, technical education in agriculture and allied subjects and on livestock improvement and animal husbandry. Control over the first two stages of cotton seed multiplication and distribution in the Province, which is financed in many tracts by the Indian Central Cotton Committee, has been retained with the Agricultural Department in view of the need for technical supervision in the production of pure nuclei of seed for further multiplication. On the administrative side, the reorganization scheme has resulted in the abolition of two posts of Deputy Directors of Agriculture out of four and the readjustment of territorial divisions from four to two, called, respectively, the "Northern" and the "Southern".

(97) In spite of the district activities of the Agricultural Department being modified as a result of the establishment of a Rural Development Department, as stated above, the rapid extension and development of scientific agricultural research and of livestock and animal husbandry work in the Province, has occupied the full time and energy of the staff of the Agricultural Department and makes ever-increasing demands on the senior expert staff. The intensive and widespread programme of Government in connection with rural development and the schemes in force for bettering the economic condition of the cultivators must be based upon definite improvement in agricultural practice which, in turn, depends upon the continuance and development of scientific agricultural research work. In addition, the increasing co-ordination of agricultural research under such organizations as the Imperial Council of Agricultural Research and the Indian Central Cotton Committee continues to add to the administrative work of the Department. All the officers on the staff of the Department have willingly borne their share of the increased duties which the expansion of work has necessitated and have given of their best in serving the interests of the cultivators of the Province.

Section I.

ADMINISTRATION.

(98) *Staff.*—Mr. W. J. Jenkins, Director of Agriculture, returned from leave out of India on 23rd November, 1938, and resumed his duties as Head of the Agricultural Department. Consequent upon his return, Mr. B. S. Patel, who had acted in his leave vacancy, reverted as Principal and Professor of Agriculture, Agricultural College, Poona, and Rao Bahadur V. A. Tamhane, who officiated in that post *vice* Mr. Patel, was posted as Deputy Director of Agriculture, South-Central Division, Poona.

Among senior officers of the Department on leave, during the year under report, may be mentioned Rao Bahadur V. A. Tamhane, Deputy Director, South-Central Division, from 24th February; 1939 to 3rd May, 1939, preparatory to retirement, Dr. G. S. Cheema, Horticulturist to Government, from 1st May, 1939 for three months, Rao Bahadur S. S. Salimath, Deputy Director of Agriculture, Southern Division, on leave on medical certificate for eight months from 6th January, 1939, and Mr. B. S. Kadam, Crop Botanist, on leave out of India for twenty months for study abroad from 5th August, 1938. The leave vacancies of Rao Bahadur Tamhane, Dr. Cheema, Rao Bahadur Salimath and Mr. Kadam were filled by Mr. K. V. Joshi, Mr. P. G. Dani, Mr. K. S. Kulkarni and Mr. M. L. Patel, respectively. Other leave arrangements were made to fill consequent vacancies but need not be recorded in this report.

(99) During the year under report, the Agricultural Department lost two of its most senior officers through retirement, viz., Rao Bahadur V. A. Tamhane and Rao Bahadur B. P. Wagholkar. Rao Bahadur Tamhane joined the Chemistry Section of the Agricultural Department in 1906 and reached gazetted rank as Soil Physicist to the Government of Bombay in the Indian Agricultural Service in 1920. Subsequently, he was appointed as Agricultural Chemist and Soil Physicist, Sind, in 1926, when he assumed charge of the Agricultural Research Station, Sakrand, in that Province. He officiated as Chief Agricultural Officer, Sind, for a short period in 1935 and, in 1937, reverted to the Bombay Province as Deputy Director of Agriculture, Gujarat. Rao Bahadur Tamhane was a most efficient soil chemist who has much valuable work to his credit both in the Bombay Province and in Sind. He

was a man of much scholastic attainment and a very valuable colleague and research worker. Rao Bahadur Wagholkar joined the Bombay Agricultural Department as a member of the Upper Subordinate Service in 1908 and, by dint of hard work and ability, worked his way upwards through the positions of Farm Manager, Assistant Professor of Dairying and Animal Husbandry, Divisional Superintendent of Agriculture to officiate as Deputy Director of Agriculture, South-Central Division, in Class I of the Bombay Provincial Agricultural Service. In 1932, he was appointed as Principal Agricultural Officer, Bombay-Deccan Sugarcane Research Scheme, Padegaon, which he held until his retirement. Rao Bahadur Wagholkar was an agriculturist of outstanding ability, possessing a very detailed and intimate knowledge of agricultural theory and practice and was greatly esteemed for his efficiency and administrative ability.

The best wishes of all their colleagues follow these two valuable officers into their well-earned retirement.

(100) The Agricultural Department in the Bombay Province suffered a very serious and much-regretted loss in the year under report through the lamented death of Rao Saheb G. L. Kottur, Cotton Breeder, Dharwar. Rao Saheb Kottur joined the Department in 1909 as a graduate assistant and reached gazetted rank as Cotton Breeder, Southern Maratha Country, in 1921. He was a botanist of great experience and ability and his name will always be linked with the improvement of the Dharwar-American and Gadag cottons of the Southern Maratha Country to which he devoted his life-work with such conspicuous success and energy.

(101) There were no cases of corruption in the Department during the year under report.

Section II.

FINANCE.

(*a*) Departmental Expenditure and Receipts.

(102) The expenditure of the Agricultural Department for the year under report was Rs. 12,54,075 as against Rs. 11,60,476 in the year previous. The increase was mainly due to financing of rural activities which are dealt with in the report separately.

The receipts for the year amounted to Rs. 2,29,382 as against Rs. 2,27,789 in the preceding year.

(*b*) Subsidies and Grants.

(103) The following grants were placed at the disposal of the Director of Agriculture for approved scheme of agricultural research, seed distribution and other propaganda activities :—

1. Imperial Council of Agricultural Research.
2. Indian Central Cotton Committee
3. Sir Sassoon David Trust Fund
4. Grants made by the Central Government for Schemes for Economic Development and Improvement of Rural Areas.
5. Donations to His Excellency the Viceroy's Livestock Improvement Scheme.

(*1*) *Imperial Council of Agricultural Research.*

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
1. *Sugarcane Research Scheme*	76,645	74,695
Total ..	76,645	74,695
Deduct Government contribution and ..	—21,713	—20,739
Deduct Contribution from the Sugar Excise Fund ..	—16,610	—16,610
Net grant from the Imperial Council of Agricultural Research	38,322	37,346
2. *Dry Farming Research Scheme*	44,135	43,587
Total ..	44,135	43,587
Deduct—Government contribution	—13,370	—13,370
Net grant from the Imperial Council of Agricultural, Research	30,765	30,217

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
3. *Cold Storage Research Scheme*	16,279	15,427
4. *Scheme for the Improvement of Marketing in India* ..	23,870	22,268
Deduct—Bombay Government's contribution	—3,870	—3,870
Net grant from the Imperial Council of Agricultural Research	20,000	18,398
5. *Poultry Research Scheme*	7,227	7,175
Deduct—Bombay Government's share	—642	—641
Net grant from the Imperial Council of Agricultural Research	6,585	6,534
6. *Sheep Breeding Scheme*	13,265	12,042
7. *Sann Hemp cultivation Scheme*	1,184	1,184
Deduct—Bombay Government's contribution ..	—44	—44
Net grant from the Imperial Council of Agricultural Research	1,140	1,140
8. *Scheme for Investigation into Virus Diseases of Plants* ..	13,526	12,598
9. *Scheme for Investigation into striga attacks on jowar* ..	1,750	1,775
Deduct—Bombay Government's contribution	—350	—355
Net grant from the Imperial Council of Agricultural Research	1,400	1,420
10. *Sugarcane Pests Scheme*	1,413	1,412
Total net grant from the Imperial Council of Agricultural Research	1,42,695	1,36,534

(2) *Indian Central Cotton Committee.*

	Name of the Scheme.	Grant. 1938-39.	Expenditure. 1938-39.
		Rs.	Rs.
1.	Broach Cotton Breeding Scheme	11,399	8,615
2.	Jalgaon Cotton Breeding Scheme	6,463	5,142
3.	Surat Seed Distribution Scheme	13,040	9,473
4.	Banilla Seed Distribution Scheme	5,755	5,630
5.	Survey of Goghari cotton	987	856
6.	Plant Puller Propaganda Scheme	3,760	3,521
7.	Technological Assistant, Gujarat	4,270	3,321
8.	Cotton Forecast Improvement Scheme, Poona ..	5,684	5,647
9.	B. D. 8 Cotton Seed Distribution Scheme	5,680	3,014
10.	Estimation of effects on cotton of the use of plant pullers	1,192	1,032
11.	Revised Jaywant cotton seed scheme	35,410	32,237
12.	Revised Gadag No. I seed scheme	9,380	8,298
13.	Clerk for Bombay Schemes	1,680	1,540
14.	Cotton Wilt Breeding Scheme, Poona	7,304	6,366
15.	Cotton Wilt Breeding Scheme, Surat	2,635	2,008
16.	Dholleras Wagad cotton improvement scheme at Viramgam	4,682	4,436
17.	Jarila seed distribution scheme	10,107	9,783
18.	Inclusion of Northern and Western cottons in Dry Farming Scheme at Bijapur	1,735	1,614
19.	Interspecific Hybridization on cottons at Surat ..	1,620	1,609
20.	Schemes for the maintenance of nucleus of improved varieties of cotton seed	2,400	1,944
	Total ..	1,35,183	1,16,086

(3) *Sir Sassoon David Trust Fund (1938-39).*

	Rs.	a.	p.
(a) Further grant for the investigations in connection with the improvement of grazing lands	440	0	0
(b) Further grant for Linseed Research Scheme ..	2,409	0	0
(c) Further grant for research work on the wilt disease of Sann Hemp	1,697	0	0
(d) Further grant for study of the betelvine bug disease	1,445	0	0
(e) Further grant-in-aid to the Marathi Agricultural School, Dhulia	500	0	0
(f) Grant for oilseed breeding scheme ..	2,345	0	0
(g) Grant for egg marketing scheme in Belgaum ..	538	0	0
(h) Further grant for the vegetable research scheme	1,299	13	3
Total ..	10,673	13	3

(4) *Village Improvement Scheme grants made by the Central Government.*

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
(*i*) Scheme for Improvement of Poultry in villages ..	2,659	2,377
(*ii*) Scheme for Encouragement of Pedigree Poultry keeping in villages	600	600
Total ..	3,259	2,977

(5) *His Excellency the Viceroy's Livestock Improvement Scheme.*

Division.	Total amount of donations received from start till 31st March 1939.	Expenditure from start till 31st March 1939.	Balance on 31st March 1939.
	Rs.	Rs.	Rs.
Gujarat	19,448	10,962	8,486
North-Central	42,196	23,627	18,569
South-Central	12,410	6,376	6,034
Southern	12,658	4,442	8,216
Total ..	86,712	45,407	41,305

(*c*) PERSONAL LEDGER ACCOUNT OF THE DIRECTOR OF AGRICULTURE.

(104) The advance under the Director of Agriculture's Personal Ledger Account (ordinarily) placed at his disposal for financing the distribution of improved seeds, implements, etc., amounted to Rs. 1,83,000 including the temporary advance of Rs. 33,000 for financing the distribution and extension of improved varieties of cotton in the Southern Division.

The total advance made during the year under report was Rs. 1,09,034–15–6 and the recoveries made amounted to Rs. 88,795–10–8 as detailed in the following statement :—

Month.	Advances.	Recoveries.
	Rs. a. p.	Rs. a. p.
Opening balance on 1st April 1938	....	1,54,005 9 6
April 1938	39,338 1 9	5,997 10 6
May 1938	13,864 8 0	3,931 6 3
June 1938	18,323 1 3	22,631 3 0
July 1938	278 15 9	29,124 15 7
August 1938	539 1 0	5,291 6 11
September 1938	2,276 4 6	7,491 13 6
October 1938	3,656 9 6	2,070 13 3
November 1938	3,144 14 6	391 4 3
December 1938	1,883 4 0	2,483 9 6
January 1939	5,209 7 6	2,587 5 0
February 1939	14,291 13 9	1,801 8 5
March 1939	6,228 14 0	4,992 10 6
Total ..	1,09,034 15 6	88,795 10 8
Closing balance on 31st March 1939	1,33,766 4 8	....
	2,42,801 4 2	2,42,801 4 2

W. J. JENKINS,

Director of Agriculture,
Bombay Province.

APPENDIX A.

List of Taluka Development Associations organised up to date.

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, the number of Taluka Development Associations was 99 at the close of the year 1938–39 distributed over the Divisions of the Bombay Province as shown below :—

Division.	District.	No.
Gujerat	Surat	3
	Ahmedabad	1
	Kaira	5
North Central	East Khandesh	12
	West Khandesh	8
	Nasik	5
	Thana	3
	Kolaba	2
South Central	Poona	10
	Ahmednagar	10
	Sholapur	7
	Satara	12
	Ratnagiri	8
Southern or Karnatak	Belgaum	4
	Bijapur	1
	Dharwar	7
	North Kanara	1
	Total ..	99

Subsidies amounting to Rs. 42,400 were granted during the year under report (1938–39) as against Rs. 40,840 granted in the previous year.

APPENDIX B.

Summary of work done at the Poona College of Agriculture, for the year 1938-39.

This is the 31st year of the College.

Staff.

I was in charge of the College as Principal during the year excepting the period from 24th May 1938 to 22nd November 1938, when I acted as Director of Agriculture. During my absence Rao Bahadur V. A. Tamhane was appointed to act as Principal and Professor of Agriculture.

Mr. K. S. Kulkarny, Assistant Professor of Agriculture, was on leave from 17th October 1938 to 11th November 1938. He has been transferred as Deputy Director of Agriculture, Southern Division, Dharwar, from 23rd February 1939 and Mr. H. B. Kulkarni, Lecturer in Agriculture, has been appointed in his place from 10th June 1939.

Mr. B. B. Joshi, Lecturer in Veterinary Science and Officer in charge, Agricultural College, Veterinary Hospital, Poona, proceeded on leave preparatory to retirement from 18th March 1939 and Mr. T. R. Khaladkar has been taken in the post from the Veterinary Department from 20th June 1939.

Mr. L. S. S. Kumar, Professor of Botany, was on leave from 22nd April 1939 to 21st May 1939 when Mr. V. M. Chavan, Assistant Professor of Botany, acted for him. Mr. V. M. Chavan was on leave from 1st July to 28th July 1938.

Mr. N. Narayana, Assistant Professor of Chemistry was on leave from 26th October 1938 to 9th November 1938.

Mr. J. P. Trivedi, Professor of Agricultural Engineering, Physics and Mathematics was on leave from 4th May 1939 to 28th May 1939 when Mr. A. A. Vasavada, Lecturer in Agricultural Engineering, Physics and Mathematics was in charge of the section.

Mr. T. N. Jhaveri, Professor of Entomology, proceeded on leave preparatory to retirement from 5th December 1938. Dr. V. G. Deshpande, Lecturer in Entomology, has been appointed in his place.

Dr. G. S. Cheema, Horticulturist to Government, Bombay Province, Poona, proceeded on leave for three months from 1st May 1939 and Mr. P. G. Dani, Assistant Horticulturist is acting for him.

There have been a few changes in the personnel of the subordinate staff of lecturers and demonstrators.

Equipment.

Library.—During the year, the second instalment of Rs. 4,800 was received for the Library to make it more up-to-date.

During the year 121 new books were added to the Library. A very valuable addition to the Library is the complete set of Saccardo's Sylloge Fungorum a valuable reference book on the Fungi of the world.

Besides this, missing numbers of several journals were also purchased. Nine periodicals were discontinued and 18 new ones were freshly subscribed for. Of these, 4 are obtained from the Library grant, 5 from the Director of Agriculture and the rest through the various sections.

The total number of books up to date is 8,060 and the number of complete volumes of periodicals is above 12,000.

The work of classification and arrangement is progressing rather slowly.

The progress in binding of completed volumes of periodicals, etc., is also very slow as it depends upon the capacity of the Yeravda Prison Press to undertake the work and there are nearly a 1,000 volumes waiting to be bound.

Laboratories.—The Government were also pleased to give a second instalment of Rs. 2,584 for equipping the various college laboratories during the year under report and the same was spent on purchasing Laboratory apparatus.

Curricula.

The Honourable Minister in charge of Agricultural Department had suggested when he visited the college in the year 1937 to give more intensive practical training in Agriculture. A scheme to extend the period of the terms of the College by six weeks was proposed and has been accepted by the Bombay University and it is expected that the college session of 1940 will begin by 1st of May instead of 10th of June. This additional period will be available for practical training in Agriculture. Besides readjustment of courses to give more practical training in agriculture including Animal Husbandry and Dairying is under consideration by the College authorities.

Studentship.

The number of students that attended during the year was as follows :—

Class.	First term.	Second term.
First Year in Science (Agri.)	73	86
Second Year in Science (Agri.)	43	43
B.Sc. (Agri.)	57	58
Total ..	173	187

Examination results.

The results of the First, Second and Final year examinations are given in the following table :—

Examination.	Number appeared.	Number passed.	Percentage.
First Year in Science (Agri.)	89	62	69·6
Second Year in Science (Agri.)	50	35	70
Bachelor of Science (Agri.)	62	54	87·09

The percentage of successful candidates in the University examinations during the triennium is as given below :—

Examination.	1937.	1938.	1939.
First Year in Science (Agri.)	63·4	50	69·6
Second Year in Science (Agri.)	88·3	87·3	70
Bachelor of Science (Agri.)	65·7	87·5	87·9

Post-Graduate courses.

The position in this regard is explained in the following table :—

Name of section.	For what Degree.	Studying in					Examinations.	
		I year.	II year.	III year.	IV year.	Total.	No. appeared.	No. passed.
Botany ..	Ph.D. ..	..	1	..	..	1	..	..
	M.Sc. ..	1	..	..	..	1	..	..
	M.Sc. (Ag.) ..	3	..	..	..	3	..	..
Agriculture ..	M.Ag. ..	..	..	1	..	1	..	..
Entomology ..	M.Sc. ..	1	1	..	..	2	..	..
	M.Sc. (Ag.) ..	1	..	..	..	1	..	..
Chemistry ..	M.Sc. ..	..	1	..	..	1	1	1
	M.Sc. (Ag.) ..	1	1	..	1	3	..	..
Horticulture ..	....	..	..	1	..	1	..	..

Special courses.

Special courses were taken advantage of by 27 students—Crop Production 9, Dairying 7, Animal Husbandry 1, Veterinary 1, Horticulture 5, Agricultural Engineering and Soil Erosion 2, Plant Pathology 1, and Chemistry 1.

Careers of Graduates.

During the year 1938-39, 33 graduates were on the roll of the Agricultural Graduates' Employment Board. Of these, 4 have ceased to be on the list.

During the year under report 16 new graduates have been registered. To encourage a larger number of graduates to be registered on the roll of the Board, it may perhaps be necessary to reduce the renewal fee to Rs. 5 for the second period of three years.

More than twenty enquiries for the employment of agricutural graduates were received during the year, and these were promptly circulated to the registered graduates on the roll.

Dr. B. N. Uppal continued to work as Secretary-Treasurer of the Board, Dr. G. S. Cheema was nominated by the Director of Agriculture, Bombay Poona, as a member of the Board.

Admission for 1939-40 for the B.Sc. (Agri.) degree course.

In all 137 duly qualified candidates (90 from the Bombay Province and 47 from outside the Province) applied for admission to the First Year Class. But only 80 candidates (64 from the Bombay Province and 16 from outside including 14 from Sind) were admitted against the total of 65 in the last year. The educational standard of the new students admitted this year from the Bombay Province appears to be better than that of the students admitted last year, as far as it could be judged from the percentage of marks secured by the students in the First Year Science examination at various colleges.

College Uniform.

The uniform dress of Khaki shorts and shirt for students was continued.

Post-Graduate Degree Courses.

No student has been registered for the post-graduate course during the current sesssion so far.

Special Courss.

Students have been admitted in the following courses :—

Subjects.	Number of students.
1. Agriculture	4
2. Plant Pathology	1
3. Chemistry	1

Scholarships

The number of scholarships for 3 years continued to be the same as in the previous year, viz. 5 for backward classes including Mohamedans and 3 for General Competition in each of the three classes.

The Students' Hostel.

During the year under report, 128 students in the first term and 121 students in the second term were residing in the hostel and seven messes were working. Professor N. Narayana has been appointed Hostel Superintendent in place of Mr. B. B. Joshi.

Sports and Social Activities.

The College Gymkhana.—The usual activities—indoor and outdoor—of the Gymkhana were carried out by the respective secretaries of the Gymkhana.

In the Inter-collegiate tournaments, Mr. S. K. Birader won the Trophy for one mile fast walking.

The management of the Electrical installation in the college hostel continued to be satisfactory.

Social Gathering.—The Annual Social Gathering of this college was held during the first week of September 1938. Honourable Mr. B. G. Kher, the Prime Minister, Government of Bombay, was the distinguished Guest and addressed the staff and students of the college in *Hindi.*

The Rovers.

There was no activity of the Agricultural College Rover Crew during the year.

Students' Literary Activities.

The Poona Agricultural College Magazine.—The Agricultural College Magazine has continued to maintain the progress indicated in the last report. Mr. Narayana continued to be the staff editor.' Students are being induced to write articls. The financial position of the magazine continued to be satisfactory with a respectable sum in the reserve fund.

Students' Guardianships.

This was continued. Its usefulness and appreciation were determined by the interest and influence the tutors were able to exert.

The University Training Corps.

U. T. C. Platoon No. 6 of this college had full strength of one Officer, five N. C. Os. and thirty one cadets (including 60 per cent. trained men) by the end of June 1938. The platoon had two military parades and a third P. T. Parade every week with satisfactory attendance. In spite of the heavy work at the college it attained a high standard of efficiency. The credit is due to all officers and cadets of the platoon.

The annual training camp was held at Moshi from 26th October 1938 to 9th November 1938, ours being third efficient platoon in the Battalion : Cpls. Merani and Pingale passed with credit the lower certificate examination qualifying for Seargent's rank.

In the advanced shooting course, cadets Mathrani and Fernandes stood first and second respectively in the company. Cadets R. K. Patil and Magdum stood first in the recruits' shooting. The platoon won four events out of seven in the Company sports winning the Hockey Shield for the fifth time in succession. Six members of the Platoon represented the "B" company in the Inter Provincial U. T. C. company shooting league and cadet Fernandes was selected for the Empire Shooting Competition.

Some members of the Platoon trained up the forest rangers and special Bunding class students in drill and P. T.

Aid and assistance to the Public

Veterinary Hospital.—Apart from the main purpose of practical instruction to the students of the college, it has continued to help the public as in the past.

The number of in and out patients during the year was 489 and 5,024 respectively as against 536 and 5,493 respectively in the previous year. The number of castrations performed was 253 and the number of cases supplied with medicines was 113.

In connection with the conversion of Government High Schools at Godhra and Bijapur into Vocational Agricultural schools, the Director of Public Instruction, Bombay Province, Poona, requested this office to purchase necessary agricultural implements and other equipment for the schools and this was done with the help of the Agricultural Overseers of the Districts, Professors of Agriculture and Horticulture, Agricultural Engineering, and the Bee Keeping Expert.

Revenue Officers' Training Class.

As decided by the Government in 1937 the revenue officers' training class was held for 10 days from 7th to 17th September 1938 and seven Assistant and Deputy Collectors attended the class.

Rangers' Course.

Forest Rangers' course of two years as been started at this college since June 1938. The present batch consists of 8 students, six of whom have been selected by the Bombay Government while the remaining two have been deputed by the Indian States—Sawantwadi and Janjira.

Research and Advice.

The function of this institution is in no way less of a research and advisory character than of teaching. In fact 60 per cent. of the total

budgets of different sections at the college is spent on research and advice. Summaries of research and advisory work done by various sections at the college are embodied in the Annual Report of the Department. During the year under report a Bee Keeping Research Scheme has been started under the control of the Principal. The work done by the Been Keeping Expert during the year has been reported separately.

Visitors.

Amongst the 25 visitors including 14 students' parties the following may be prominently mentioned :—

(1) His Excellency the Governor of Bombay.

(2) Honourable Mr. Morarji Desai, Minister of Revenue and Agriculture, Province of Bombay.

(3) His Highness the Maharaja of Dhar, his guardian and the Dewan Saheb of Dhar.

(4) Lieut. Col. A. J. Muirhead, Under Secretary for India, and Mr. E. H. Kelling, M.P., Parliamentary Secretary to the Under Secretary of State for India.

(5) Imperial Agriculturist.

Corruption.

There has been no case of corruption in the year under report.

B. S. PATEL,

COLLEGE OF AGRICULTURE : Principal,
Poona, 4th August 1939. College of Agriculture, Poona.

Programme of work for the year 1939-40.

ADMINISTRATION AND CONTROL OVER THE TEACHING ACTIVITIES, WELFARE OF THE STUDENTS OF THE COLLEGE AND THE READJUSTMENT OF THE COLLEGE COURSE OF STUDIES SO AS TO GIVE MORE PRACTICAL TRAINING TO THE STUDENTS IN FARM OPERATIONS.

B. S. PATEL,

COLLEGE OF AGRICULTURE : Principal,
Poona, 4th August 1939. College of Agriculture, Poona.

APPENDIX C.

Summary of work done under the Deputy Director of Agriculture, North Central Division, for the year 1938–39.

(Thana, Kolaba, Nasik, West Khandesh and East Khandesh.)

I. SEASON.

In the districts of Thana and Kolaba monsoon started early commencing from the last week of May, it was continuous in the months of June and July with breaks here and there in the months of August and September. In the first week of October there was heavy rain which caused damage to the early and late crops of paddy to some extent. Banana plantations were also affected by these heavy showers. The paddy crop was in general a 12 anna crop. There was no rain in the Rabi season. The average rainfall in these two districts was above the normal.

In Khandesh too, monsoon broke out in the last week of May and was practically continuous upto the end of September, though there were short breaks in August and September. The heavy showers that occurred in the first week of October caused shedding of cotton bolls and washed away the pollen of jowar flowers. Due to the continuous rains the operations of weeding and interculturing could not be done satisfactorily.

The continuous rains of June and July made the jowar plants abnormally stunted in growth and the earheads were half developed. This brought down the normal jowar yield to 40 to 50 per cent. The yield of cotton also suffered through out Khandesh to the extent of 10 to 15 per cent. as compared to the yield of the preceding year. The groundnut crop suffered the least that is to the extent of 10 per cent. The crop of wheat did not suffer in yield though the grain development was not satisfactory.

In the Nasik district too, monsoon broke out early and the rains were continuous. The heavy showers of October spoiled the yields of cotton, bajri and groundnut, reducing them to the extent of 20 per cent. below normal. The rains of October were, however, found beneficial to the crops of sugarcane, wheat and gram. In some parts of the Nasik district, the Rabi crops did not yield well for want of sufficient moisture and the prevalence of cold breezes.

In all the districts mentioned above the rainfall this year was above normal.

Pests and diseases of crops of the following description were found severe this year. Aphis was common on cotton and on many vegetable crops. Chilly crop suffered from leaf curl in the Nasik district. At

Bassein and round about betel-vine suffered heavily from wilt due to early commencement of monsoon and later due to the heavy showers of October. Attack of nematodes, a new menace to the betel-vine had made its appearance this year.

Sugarcane suffered from Stem-borer in the Nasik district. Wingles grass-hoppers attacked bajri crop in Yeola Taluka over an area of 2,000 acres. The rat trouble to the wheat crop was observed in many places. All precautionary and control measures were taken by the Department against the diseases and pests mentioned above.

The prices of cotton were the same as last year. Rates of groundnut rose by about 10 to 15 per cent. i.e., from Rs. 10–15 to Rs. 12–13 per palla of 240 lbs. Prices of grain crops including wheat remained the same as last year. Price of gul, was, however, doubled this year bringing more money into the pockets of cane growers.

The condition of cattle was satisfactory there being sufficient fodder and drinking water. The economic condition of the agriculturists continues to be unsatisfactory as last year due to the low prices of cotton and groundnut. The prices of gul had, however, risen and the cultivators were at an advantage so far, as this commodity goes. Labour wages had remained the same as last year.

II. RESEARCH AND EXPERIMENT.

COTTON.

1. *Plant Breeding Work.*—This is the second year of the extension scheme started for the improvement of Khandesh cotton and is to run for a period of five years.

The rigid yield trials of some N. V. strains referred to last year were dropped from this year as none of them were found superior to Jarila.

This is the third year of the village trials of Jarila. Out of the 38 trials Jarila yielded more than the local in 16, gave equal results in 10 and yielded less than the local in 12 trials. Taken collectively there was no significant difference between the yield of Jarila and local, as was the case in 1936–37. Last year, however, Jarila had yielded better than the local. This year the ginning percentage of Jarila varied from 33 to 38 in the districts as against 32·5 to 36·0 of last year.

Both farm and commercial samples of the lint of Jarila were sent to the Technological Laboratory, Matunga, for spinning tests. The variety (Jarila) was found capable of giving highest standard warp counts from 27 to 30 as against 22 to 36 of last year. A sample of lint from Taloda has given an exceptionally high number, viz., 38 counts. This is attributed partly to the silky feel of the lint not possessed by other samples.

Five commercial bales of Jarila (Weighing nearly 400 lbs. each) brought from different parts of Khandesh were sent to the E. D. Sassoon and Tata Mills of Bombay, for spinning tests. Half of each bale was sent to one mill and the other half to the other mill for separate tests. The average warp counts given by both the mills for all the five bales varied within a narrow limit of 20·85 to 22·02, for average strengths varying from 50 to 70 lbs. A test on a single bale made by Century Mills, Bombay last year, gave 19·9 average counts for a strength of 80 lbs. The prices obtained at the auction sales of Jarila were encouraging and the premium ranged from Rs. 7 to 48 over Broach per khandi (784 .lbs).

The Jarila was found to be highly wilt resistant in the district, even in highly wilt affected areas, as last year.

The F1 plants of the cross Jarila × N.R-5 made last year were further crossed with New Million Dollar, a wilt immune strain, evolved by the Plant Pathologist, Poona, to incorporate the character of immunity into Jarila. The progenies of the crossed bolls will be studied next year. The F2 population of the straight cross Jarila × N.R-5 will also be studied to select a plant possessing all good characters of Jarila and the high ginning quality of N.R-5.

The study of the cross of Jarila × Million Dollar made last year was discontinued since the second parent (Million Dollar) though highly wilt resistant is not wilt immune like the *New Million Dollar* mentioned above.

The 27 plant selections made from an original collection at Chandur were further increased to 38 at the time of sowing. All were grown individual rows in the year under report. The 120 selections made from these for the next year will be grown along with Jarila in replications for further study and a duplicate set will be grown in wilt plot to judge their resistance to wilt.

A nucleus for producing 200 lbs. of selfed seed of Jarila was maintained at Jalgaon farm. The quantity actually produced was 178 lbs. of seed. The whole of this seed will be grown next year on Jalgaon farm by the Superintendent.

2. *Cotton Manuring—Object.*—To see if decomposition of Sann crop used for green manure, is hastened by the application of Farm Yard Manure at the time of its incorporation with the soil and if thereby it produces greater effect on the succeeding crop of cotton in the following year.

As per details given in the last year's report, the experiment was conducted this year at Jalgaon farm. Jarila was sown on all the plots, and the plot yields were statistically analysed. As the effect of Sann green manure *plus* Farm Yard Manure did not show significant difference

in yield over Sann green manure alone it has been decided to discontinue the experiment.

3. *Topping Versus Non-topping of Cotton—Object.*—To see the effect of topping, cotton plants on their yield.

This is the second year of the experiment. The experiment was arranged in duplicate plots and the plants were topped when they were about 2½ to 3 feet tall. In this, as well as last year, the differences between yield of the topped and non-topped plants were negligible. It has therefore been decided to discontinue this experiment.

JOWAR.

Plant Breeding Work.—The four jowar strains, viz., 17, 41, 44 and Salsingi mentioned last year were sown in 8 replications along with the local on one guntha plots. Due to the unusually heavy rains of June, July and August the crop remained stunted and produced smaller earheads. Further the earheads were not uniformly filled up due to the heavy rains and dashing winds that occurred in the month of September at the time of flowering. There was excessive lodging of plants in all the strains. It was, however, the worst in strains 17 and Salsingi and the least in strains 41 and local, strain 44 taking the middle position.

In point of grain yield strain Nos. 41 and 44 gave significantly better results than the local though last year there was no significant difference between any two varieties. Regarding fodder weight strain Nos. 17 and 44 have given statistically better results than the local, while last year strain Nos. 44 and Salsingi had done better than the local.

The trial of these strains shall be repeated.

Village trials for the introduction of Maldandi jowar (Strain No. 35-1) were taken in six villages in Shirpur taluka in comparison with local variety. It was found that the new strain gave 9 to 12 per cent. more yield than the local.

WHEAT.

1. *Sann green manuring—Object.*—To see the effect of Sann green manure on the succeeding crop of wheat.

The experiment was laid out on Jalgaon farm by the ABBA method with six replications. The area of a single plot was 2½ gunthas. As in the past two years, this year too, there was no significant difference in yield between the green manured and control plots.

The experiment, however, shall be repeated.

Trails taken in the districts indicate that Sann green manure gives more yield but it is not known how far the increased yield is statistically a real one.

2. *Trial of Improved Wheat Seed-Drill.*—This implement was tried along with country seed-drill in duplicate plots of 8 gunthas each.

There has been no appreciable difference in yield of grain as well as of Bhusa. However, the following points are in favour of the improved seed-drill, if it is used on a Co-operative basis.

(1) Less draft.
(2) Saving of one labourer.
(3) Saving of 15 lbs. seed per acre while sowing.
(4) Regular dropping of seed.

Wheat strains Pusa 111, Pusa 165 and Pusa 4 were tried at Sakri for yield purposes. It was found that Pusa 4 gave 334 lbs. and 160 lbs. more yield per acre over Pusa 165 and Pusa 111 respectively. Another yield trial of Pusa 4, Pusa 165 and local Mondya was taken at Pimpalner in Sakri taluka on 10 guntha plots. It was found there that Mondhya gave 31·3 and 16 per cent. less yied than Pusa 4 and Pusa 165 respectively.

CASTOR.

Castor strain S. 20 was tried with local variety at Pokan in Sakri taluka on 10 guntha plots. Strain S. 20 gave 28 per cent. increase over the local.

RICE.

Manurial Experiment with Oil-Cake.—As mentioned in the last year's report, village trials to study the effect of Castor cake on the yield of grain and straw of rice were undertaken in 7 places including the talukas of Pen, Panvel and Karjat. The percentage increase in grain over the no manure plots ranged from 17·0 to 50·0 and in straw from 18·0 to 91·0. The dose of Castor cake applied per acre was 1000 lbs. containing 40 lbs. of Nitrogen. Except at Halivli, Taluka Karjat, the addition of Castor cake has not been found paying due mainly to the unfavourable differences between the prices of the manure and of the increased yield.

III. AGRICULTURAL SERVICE AND PROPAGANDA.

PREVENTION OF SOIL EROSION.

The anti-erosion campaign was continued with good progress throughout the division.

The following are the places where anti-erosion work was done no à large scale.

Place.	Area protected.
Nasik section	3,839 acres.
Malegaon section	2,300 acres.
Dondaicha section	798 acres.
Jalgaon section	907 acres.
Bhusawal section	633 acres.
Dhulia	690 acres.
Sakri	699 acres.
Shirpur	494 acres.
Total ..	1,883 acres.

Due to an extensive propaganda the cultivators have now taken up this improvement and a large number of acres is being brought under control by themselves.

Training classes in bunding.—Training classes in bunding were held at the following places.

Place.	Attendance.	Date.
Dondaicha	50 cultivators ..	20th February 1939 to 3rd March 1939.
Mohadi	50 cultivators ..	5th March 1939 to 16th March 1939.
Satana	50 cultivators ..	20th March 1939 to 31st March 1939.

IMPROVEMENT OF SOIL FERTILITY.

Efforts to educate the people to increase the supply of organic bulky manures in different forms and to apply the same to the soil to improve its fertility were continued as follows.

1. *Farm Yard Manure.*—The propaganda to store this manure in pits and spread it evenly there so as to create conditions for uniform decomposition has been in progress. In Malegaon and Nasik sections 291 such pits were newly dug out. This is being followed in other parts of the division also.

To preserve the Farm Yard Manure in the best possible way 323 new pits were dug out during the year under report. This makes the total of 2,405 manure pits in Dhulia section.

2. *Compost Manure.*—Propaganda for the utilisation of all kinds of farm refuse for turning them into compost manure was continued. In East Khandesh District 5,754 cart loads of compost manure were prepared with the help of a compost man specially appointed for this purpose from Village Improvement Funds.

In Nasik District 4,950 cart loads of compost manure were prepared in heaps and pits and the process of making compost was demonstrated at a number of places.

During the year under report 140 cart loads of compost manure were prepared in 35 villages by 81 farmers.

3. *Green Manuring.*—Green manuring of Sann is getting popular day by day. In East Khandesh 10,850 lbs., in West Khandesh 14,441 lbs. and in Nasik district 43,190 lbs. of Sann seed were distributed for green manuring. The District Improvement Committees helped to supply the seed.

6,266 lbs. of Sann seed was distributed for green manuring purposes to 63 cultivators. This covered an area of 130 acres.

4. *Bone Manure.*—Charring of bones to make them brittle for easy crushing before using them as manure was demonstrated in a number of places. 3,420 lbs. of bone manure were prepared in East Khandesh, 984 lbs. in West Khandesh, 2,413 lbs. in Nasik District and 4,800 lbs. in Basein.

3,698 lbs. of bones were charred for preparing bone manure and was used in 18 villages by 20 cultivators. While 510 lbs. of bone meal manufactured in factories was used by 19 cultivators in 10 villages.

5. *Fertilisers and Cakes.*—Sulphate of ammonia is the most widely sold fertiliser for irrigated crops, especially for sugar cane. Use of groundnut and castor cake is also very common. The distribution of these is chiefly done by the Taluka Development Associations.

6. *Common Salt.*—Advantage of the concession for denatured salt for manurial purposes given by the Government is fully taken by the owners of the Mango orchards in North Konkan. During the year under report 775 maunds of salt were purchased in Thana District.

SUPPLY OF SEED OF IMPROVED VARIETIES.

Jarila Cotton.—As referred to in the last year's report the seed multiplication and distribution scheme for Jarila cotton was followed

this year too. The amount of seed distributed this year was as follows:—

Nature of the stocked seed.	Quantity in lbs.
Seed from the III and IVth stage	= 87,150
Seed stocked by the registered growers ..	= 11,330
Total ..	= 98,480

The total area covered by the above quantity of seed is 4,980 acres through out the East and West Khandesh and Malegaon taluka of Nasik district.

Besides the above area covered by the Department an equal area of about 5,000 acres has been found under natural spread. 5,19,256 lbs. of Jarila cotton seed of different stages have been stocked for distribution in the year 1939–40.

Surat 1027 *A.L.F. Cotton.*—During the year under report a total quantity of 11,120 lbs. of fresh seed of 1027 A.L.F. was distributed in Nandurbar and Nawapur talukas of West Khandesh, to cover up an area of about 1,400 acres. The natural spread is also going on gradually as reported last year.

WHEAT.

Strains distributed.

1. No. 224.
2. No. 168.
3. No. 808.
4. Pusa No. 4.

There are 3 taluka seed farms for Pusa No. 4 strain and 2 for No. 168 strain. The total quantity of wheat stocked for distribution in 1939–40 for seed growers was 5,400 lbs. of Pusa 4 and 254,000 lbs. of No. 168. The total area under Pusa 4 was 5,075 acres and under No. 168, 900 acres in Dhulia section.

As mentioned in last year's report wheat strain No. 224 being more suitable for East Khandesh District, 66,040 lbs. of it were distributed. This quantity was sufficient for 1,217 acres. In West Khandesh 89,018 lbs. of seed of strain No. 168 were distrubuted to cover an area of 1,312 acres, while in Nasik district 63,200 lbs. of strain No. 808 were given out for 1,325 acres. 8,800 lbs. of Pusa No. 4 wheat were distributed in East Khandesh, 6491 lbs. in West Khandesh and 10,843 lbs. in Nasik District.

Year by year the natural spread of these strains is increasing.

OTHER SEEDS.

1. *Akola Bajri.*—The distribution of Akola bajri which is gaining popuarity in West Khandesh and Nasik district was made as follows. 2,282 lbs. of seed were given in Dondaicha section in West Khandesh to cover aln area of about 460 acres. In Nasik district 2,465 lbs. of seed to cover an area of about 500 acres were given out.

There are 12 seed farms of Akola Bajri and 18,720 lbs. of Bajri seed was distributed by these farms to 21 seed growers. The total area under this variety was 18,393 acres in Dhulia section.

2. *Maldandi Jowar.*—In West Khandesh 12,367 lbs. of the seed of this variety was distributed in Dondaicha section through the Taluka Development Associations, to cover an area of about 2,473 acres. The supply of this variety in East Nasik was 2,020 lbs. sufficient to cover an area of about 400 acres.

RICE.

3. *Nialo Jowar.*—There are 9 seed farms and 126 seed growers of this variety. The total area is 135 acres in Dhulia section.

Improved varieties of Rice continued to be distributed in the districts of Thana and Kolaba. Pure seeds of improved types were grown as usual at the seed multiplication centres. The distribution work for each variety is detailed below:—

1. *K*-42.—This variety is mainly suited to Kolaba and south Thana. In Kolaba 2,800 lbs. of seed were given to the seed-growers. Everywhere the improved variety has impressed the people and the seed is in demand.

2. *K*-184.—This is suited to high lying early rice fields and is distributed in North Thana. 210 lbs. of seed were given to Taluka Seed Farms.

3. *K*-226. This improved strain was under spread in north Thana. 630 lbs. of seed were given to Taluka Seed Farms. 5,200 lbs. are given to registered seed growers, during the year under report.

4. *K*-540.—The spread of this variety is in progress for the last 4 years. The quantity given out to seed growers is 490 lbs. while 6,680 lbs. were distributed to registered seed growers.

5. *K*-412. This is suited for highly fertile fields near village sites. 70 lbs. of this seed were given to Seed Farms in Thana district, while 140 lbs. were distributed in Kolaba district. Besides the above, 960 lbs. were distributed in north Thana.

In Nasik district strain No. K-42, K-412 and K-226 were distributed and the total area covered by these strains is 322, 16 and 52 acres respectively.

IRRIGATED CROPS.

Sugarcane—

Strains distributed.

1. C.O. 290.
2. E.K. 28.
3. H.M. 320.
4. P.O.J. 2878.
5. C.O. 413.
6. C.O. 419.

C.O. 290.—The variety is high yielding, early and fairly frost-resistant. Gul from this variety is slightly saltish to taste. However, it is noticed that the ratoon of this variety produces fairly good quality of Gul. The area under this continued to increase in Nasik district in the Talukas of Malgeaon and Baglan where 360 acres are under this cane.

E.K. 28—This variety is also getting popular in Nasik district on Girna and Kadva canal areas. The area under this variety in Nasik division and Malegaon division is 139 acres. The kind of "Gul" obtained from this is always of an excellent quality.

H.M. 320.—This chewing variety continues to be grown round about Nasik and its area is 100 acres.

P.O.J. 2878.—This is a hard cane but it produces best kind of gul. In the talukas of Malegaon and Baglan of Nasik district its area is 115 acres.

C.O. 413 *and* 419.—These have been newly introduced in Malegaon section.

Propaganda of wider planting and top-dressing of sugarcane and the use of Poona furnace was continued. These improvements have now been taken up by the majority of cane growers on canal areas.

Lucern.—During the year under report 1,300 lbs. of lucern seed sufficient for 161 acres was distributed.

Vegetable seed.—601 lbs of vegetable seed of various kinds was distributed.

DEVELOPMENT OF HYDRO-ELECTRIC TAIL VALLEYS.

The Yeranzade Scheme.—As stated in the last year's report the first irrigated co-operative farm under the scheme was started in December 1937 at Yeranzade. After deducting the cost of marketing the gross income to the cultivators partaking in the scheme came to Rs. 1,311–13–9 from crops on an area of 8 acres and 20 gunthas. The produce which the cultivators used at home has not been taken into account in finding out this income.

During the year under report the second pumping plant has been set up under the scheme at Dhoke, a village about 4 miles from Badlapur, downstream. About 3 acres of crops of chillies, onion and brinjals were taken on this Dhoke co-operative farm by the Dhoke villagers. At Yeranzade the cultivators continued there work of irrigated farming and planted about 12 acres. The chillies crop continues to give pickings and so the returns of this year are not yet complete.

FRUIT CULTURE.

The area under fruit cultivation is increasing throughout the division and particularly in Khandesh districts. A very large number of budded plants and grafts was supplied to the cultivators with the help of the Taluka Development Associations.

In Dhulia section 5,049 citrus plants, 449 mango grafts and 1,333 grafts of other fruit plants were distributed. 182 wild bor trees were budded with Meharun bor buds. While 231 Santra and Mosambi plants were budded with buds from improved varieties of these plants.

In East Khandesh 2,750 plants of citrus varieties, 100 quality mango grafts, 45 Meharun bor buds and 500 grape vine cuttings were supplied. While in West Khandesh 6,370 citrus plants, 675 mango grafts and 127 Meharun bor buds were distributed.

The Horticultural Sub-overseer, who is working in East Khandesh has concentrated his attention in developing 250 fruit gardens in Nashirabad and Shendurni centres. He spent one week in every month on each of these centres and demonstrated all improvements. Besides the above work he visited 38 gardens and gave advice. He selected 3 sites for the lay-out of new gardens, and gave 52 horticultural demonstrations. He treated 2,450 orange plants for gummosis and 2,500 for stem borers and supplied 687 Meharun bor buds for budding.

In Nasik district 1,275 grafts of citrus plants, 171 of mango plants and 224 of guava plants were distributed. Besides 300 G.B. 8 pomegranate seedlings and 1,575 Meharun bor buds were also supplied.

In Thana and Kolaba, 875 citrus plants, 1,167 mango grafts, 18 chiku plants, 650 Meharun bor buds, 220 plants of cashew nut and jack fruit, and 2,800 pine apple suckers were given out.

IMPROVED IMPLEMENTS.

During the year under report 200 improved implements such as iron ploughs, harrows, fans, spray pumps were sold either through the Department or Taluka Development Associations in Jalgaon section. The number of improved implements of the above type kept for hire in Taluka Development Associations or implements depots in Jalgaon section was 394 which gave Rs. 2,749 as hire charges.

In Dhulia section 186 iron ploughs were kept for hire and the total hire charges realised were Rs. 1,622.

There are 12 private agencies dealing in iron ploughs and they had kept 172 ploughs to be given on hire. Besides this it is estimated that there are about 112 iron ploughs owned by cultivators.

The Departmental staff had also supplied other improved implements and appliances such as Sayan Harrow, Oil Engine etc. to needy cultivators. The total value of these was Rs. 1,559.

In Nasik District 389 iron ploughs and 30 other implements were sold and 778 ploughs and other implements were kept for hire. The total hire charges realised amounted to Rs. 6,883.

CONTROL OF PESTS AND DISEASES.

1. *Betelvine Wilt Disease.*—Since rain commenced earlier this year the lowering of vines had to be done in the rain and this caused heavy wilt infection in many betel-vine gardens of the Bassein taluka. The sudden gale and heavy rainfall that occurred in the first week of October also added to the severity of the disease. The infection was, however, brought under control by the application of Bordeaux mixture to the soil. Fresh flush of wilting appeared in the cold season (November and December) but this was later found to be caused by the "nematodes." No treatment against nematodes is yet known. Wilting caused by the nematodes is different from that caused by Phytopthora fungus.

Concentrated work for the control of wilt was done in Kawlar Khurd village on the west coast in 15½ acre zone, covering 108 betelvine plots. Propaganda for controlling the wilt was made either by personal visits to the cultivators or by holding group meetings and arranging tutorial classes. During the year 1,904 lbs. of Copper Sulphate and 1,925 lbs. of good quality lime stone were stocked and sold to cultivators at lower rates than those prevailing in the market. Out of 530 acres under betelvine in Bassein taluka 300 acres were treated with Bordeaux mixture this year.

2. *Powdery Mildew on Betelvine.*—There was a fair amount of powdery mildew on betelvines from November to March and even uptil May and June in old plantations. For this sulphur dust has been advocated and it has become popular.

3. *Mango Hoppers and Mildew.*—Mango trees were dusted with sulphur at Gokhivare (Taluka Bassein) and the dusted trees gave

much higher bearing. Thirty mango trees were similarly dusted in Palghar taluka.

4. *Gummosis on Citrus Trees.*—In Bhusawal division 65 trees were treated with creosote oil. In all 3,000 plants have been treated in Khandesh and 50 in Malegaon taluka of the Nasik district,

5. *Potato Rust.*—In Malegaon taluka 66 lbs. of fine sulphur powder were used to control the rust.

6. *Powdery and Downy Mildew on Grapes.*—In Nasik district sulphur dusting was done on a large scale against powdery mildew and Bordeaux mixture was used against downy mildew.

7. *Leaf Curl of Chillies.*—In Palghar tobacco waste was used for spraying against the leaf curl. In Yeola taluka 170 lbs. of tobacco waste were utilised for this purpose. 4 lbs. of Nicotine Sulphate were supplied in the Bhusawal division.

21 lbs. nicotine sulphate was used against leaf curl of chillies over 101 acres.

8. *Jowar Smut.*—The following number of sulphur packets was distributed to control jowar smut.

Two thousand and thirty sulphur packets were supplied to 867 cultivators in this division.

Name of the Sub-division.	No. of sulphur packets distributed.
Jalgaon	3,000
Dondaicha	4,330
Malegaon	1,100
Yeola	350

9. *Cocoanut Leaf-eating Catterpillar.*—This pest appeared at Uttan (taluka—Bassein) in the beginning of 1938 and spread through out the rainy season. The work of cutting and burning the affected fronds, to control the pest, was arranged in co-operation with garden owners.

10. *Steam Borer.*—In Bhusawal sub-divisions the use of petrol and kerosine was advocated to kill the steam borers of citrus trees. In all 3,000 plants of citrus were treated in Khandesh and 29 mango trees were similarly treated in Malegaon taluka of the Nasik district.

11. *Fruit Moth.*—In Malegaon taluka 5,600 paper bags were sold to control the pest to owners of three gardens in three villages.

Two hundred and eighteen citrus trees were treated against fruit moth.

12. *Rats.*—Trouble of rats to the wheat crop was rather severe this year in the whole division. Five hundred acres of wheat were controlled by cyano gas dusting and by the use of lead arsenate baits in the Bhusawal and Yawal talukas. In Dondaicha sub-division 37½ lbs. of

cyano gas were used while in Jalgaon sub-division 20 lbs. of it and 5 lbs. of lead arsenate were utilised for preparing baits.

91 lbs of cyano gas "A" dust and 1 lb. of lead arsenate were used against rats on wheat over 1,320 acres.

13. *Wingless Grass-hoppers.*—In Chandvad taluka of the Nasik district 2,000 acres of Bajri were infested by hoppers. Tin sheets and moving cloth bags were used to catch the hoppers.

14. *Aphides.*—In Nasik sub-division Aphides occurred on lucern, cabbage and other garden crops. They were controlled by the use of fish oil rosin soap. One hundred and sixty lbs. of tobacco dust for preparing the decoction against aphides on lucern was used in Malegaon sub-division.

Eleven lbs. of fish-oil rosin soap, kerosene oil emulsion and tobacco decoction were used against this pest over 19 acres.

15. *Loranthus on Mango.*—In Malegaon sub-division 172 mango trees were treated by cutting loranthus from its host plant.

Loranthus on mango was cut out from 168 trees.

16. *Wild Pig Campaign.*—Four gun-club groups were organised this year, two being in Bhusawal and two in Jalgaon taluka. In all 328 pigs and 36 blue-bulls were killed.

17. *Stray Cattle.*—In Bhusawal sub-division 5,000 agave bulbs were supplied to three cultivators for fencing their fields against stray cattle.

SHOWS, DEMONSTRATIONS AND CLASSES.

1. *Agricultural and Horticultural Classes.*—During the year under report seven classes to train Honorary Agricultural Agents were held, at the following places:—

Name of section.	Place where class was held.	Attendance.
Bhusawal ..	Jalgaon Farm ..	25
Jalgaon ..	Jalgaon Farm ..	20
Dhulia ..	Mohadi ..	20
Dondaicha ..	Dondaicha ..	20
Malegaon and Yeola	Malegaon ..	30
Nasik ..	Adgaon ..	20
Palghar ..	Palghar ..	20

At the above classes training regarding all agricultural improvements was given by way of demonstrations, lectures and practical work in the field.

Besides the above, three other classes were held, one at Mangarul in Nasik district, 2nd at Andhari and the 3rd at Mahalaxmi in Thana district. These were attended by 150 cultivators. All the improvements in horticulture and agriculture were taught by way of demonstrations and lectures.

2. *Shows.*—A small agricultural show was arranged at Chandanpur in Nasik district in January 1939 during the annual fair. About 8,000 cultivators attended the show. Another such show was organised at Mahalaxmi which was attended by about 700 cultivators.

During the year under report 8 shows were held in villages. All were largely attended.

3. *Rural Uplift Van.*—The Rural Uplift Van toured in this division during the months of February to May 1939. At all the places of halt the district staff gave demonstrations and lectures with and without the help of magic lanterns. The necessary exhibits, models, appliances, leaflets. etc., were carried by the staff with the Van.

4. *Field Demonstrations and Lectures.*—The district staff as usual had arranged a very large number of demonstrations and lectures on various agricultural improvements in cultivators fields with the help of Taluka Development Associations. These have been classified according to subjects and detailed in the following table :—

Shows and Demonstrations.

Kind of demonstration.	East Khandesh.		West Khandesh.		Nasik.		Thana.		Kolaba.	
	No.	Attendance.	No.	Attendance.	No.	Attendance.	No.	Attendance.	No.	Attendance.
Crops	38	1,200	65	1,671	85	1,644	22	780	..	..
Manures	98	920	62	1,363	61	769	60	1,086	..	..
Implements ..	92	1,389	223	2,020	155	1,623	..	..	..	..
Control of pests and diseases ..	107	1,650	61	300	164	1,895	8	65	..	..
Magic Lantern ..	..	..	23	2,000	7	3,750	10	1,150	..	..
General Demonstration	12	130	46	1,420	48	2,900	45	1,851	34	1,000
Cattle shows ..	3	2,250	6	2,900	3	125	..	..	..	..
Agricultural shows ..	..	..	..	..	..	..	..	..	..	..
Fair Demonstration ..	5	2,650	9	8,000	5	1,750	..	..	..	..
Van Demonstration ..	8	3,150	..	..	27	12,800	..	..	..	..
Gul making ..	..	..	15	100	2	35	..	..	..	..
Anti-erosion ..	5	380	..	..	32	1,675	..	..	..	..

INFORMATION SERVICE.

The members of the district staff continued to contribute articles of practical utility to the marathi magazine " Shetki and Shetkari " and to the marathi papers, such as, Dnyan Prakash of Poona, Nawakal of Bombay, Vijay of Jalgaon, Bharat of Dhulia and Gavkari of Malegaon. The total number of articles contributed was 15.

The Taluka Development Associations continued to subscribe for a large number of copies of Shetki and Shetkari magazine for free distribution. The village leaders and school teachers read the magazine to villagers. Members of the district staff did likewise during their halts in villages.

The Departmental staff supplied 2 copies of "Amachi Sheti ", 6 copies of " Fulzadacha Bag", 3 copies of " Kombadyanchi Jopasana", 3 copies of " Kalme karanyache Shastra ", 1 copy of " Bhaji Palyachi Lagwad " and 4 copies of bound volumes of leaflets. Besides this, number of leaflets on various subjects had been distributed at the time of classes, demonstrations and shows.

One hundred and eight copies of Shetaki and Shetakari were purchased and distributed to depôt kamgars and prominent leaders in villages for reading. Forty books on agricultural subjects were kept by the Dhulia Association and these were given to cultivators for reading. Fifteen bound volumes of leaflets were sold to cultivators. There is a library of 150 useful books maintained by the Taluka Development Association, Sakri. In all 6 articles on agricultural subjects were written by the staff in Dhulia section and these were published in local news papers.

TALUKA DEVELOPMENT ASSOCIATIONS.

The Taluka Development Associations in this division continued to contribute towards agricultural improvements under the Departmental guidance.

It is however seen that very few Associations do appreciable works Wherever the Fieldmen of these bodies are conscientious workers, the Associations have done excellent work and are also financially sound. Associations at Malegaon, Satana, Ozar, Jalgaon, Jamner, Raver and Dahanu are of the excellent type. The Malegaon and Satana Associations realised as much as Rs. 3,250 and Rs. 3,010 respectively by way of hire of implements, as against Rs. 2,600 and Rs. 2,175 in the previous year. The Ozar and Jalgaon Associations got Rs. 1,000 and Rs. 503 respectively for this activity. They also supplied large quantities of manures and fertilizers amounting to 292,304 lbs and 179,867 lbs. respectively. The Jalgaon and Jamner Associations run cattle breeding farms. The Raver Association conducts sikar work against wild pigs. The Dahanu Association has conducted 30 grain depôts and distributed 16,055 lbs. of Kolamba paddy seed. All these Associations have more than two centres of work in their talukas and they carry on propaganda of all the improvements recommended by the department.

DHULIA AGRICULTURAL SCHOOL.

The Agricultural School at Dhulia has now completed its 16th year. Eighty-three applications were received for admission to the school from East Khandesh, West Khandesh and Nasik district. Out of these 19 were selected. The total strength of the boys during the year under report was 33. The result of the Annual Examination was satisfactory. Fourteen boys of the second year and 19 boys of the first year were declared successful.

Equipment for practical teaching has been maintained at a high standard. There are fruit, vegetable, and flower gardens, poultry runs, work shop for carpentry, smithy and weaving, an oil engine and pump for irrigation, and a large area for the growing of jirayat crops. The boys prepare compost manure from farm refuse in kharif and rabi seasons. They also use trench latrines and apply the resulting poudrette to their fields as manure.

The boys receive a stipend of Rs. 6 per month from the Local Advisory Committee, and manage their boarding on club system under the guidance of the head master. The average expenditure per boy came ot Rs. 5–10–0.

The Local Agricultural School Committee consisting of nine members worked as usual under the chairmanship of Rao Saheb B. R. Ransing, B.A., LL.B., 4 meetings were held during the year to discuss the school problems and to allot scholarships to students. The Committee received Rs. 2,000 as donations. They spent Rs. 1,917-8-0 as stipends to students and have a balance of Rs. 4,597 on hand. The Committee deserves thanks for the continued interest it has been taking in the promotion of primary Agricultural Education.

The Farm had rendered invaluable service to the public by affording the supply of pure seeds worth Rs. 583 of cotton, groundnut, bajri and vegetables.

REGULATED COTTON MARKETS.

In this division there are four regulated cotton markets, Of these the one at Dhulia and the one at Amalner are old and well established. These have been doing their work quite satisfactorily. The one at Jalgaon started its work in the year under report. Though this was its first year the following transaction will show that it has made a good beginning.

The arrivals of the cotton carts in Jalgaon market have been 7,980, of seed cotton, 320 of cotton lint and 12 of cotton waste. The following workers were given the licenses for transacting business in the cotton market. These were, 3 Adatyas, 11 Dalals, 35 buyers and 19 weighmen. Out of the 35 buyers 15 were from outside. The market committee has been experiencing slight opposition here and there but it will be overcome without much difficulty.

The Dhulia Cotton Market continued to work as before. The number of carts received this year was 47,260 of seed cotton and 788 of ginned

cotton. The total receipts are Rs. 10,292 and the total expenditure incurred is Rs. 8,561.

The market at Dondaicha was started last year and in this year the preliminary work of the formation of various committees, preparation of bye-laws, selection of site and selection of employees have been completed. It is hoped that this market will start regular work from the next year.

IMPROVEMENT OF LIVE-STOCK.

1. *Gift Bulls.*—His Excellency the Viceroy's Scheme of cattle improvement continued to work in all the districts with full vigour. A regular record is maintained of the services of the Gift Bulls located in this division and it is observed that they are giving good performance and the progress in that direction is satisfactory. During the year under report 6 new bulls have been located in Kolaba and Bombay Suburban districts. Besides the above scheme, 12 new stud bulls are maintained either on premium system or by private individuals in Nasik district.

During the year under report 43 new stud bulls were located in Dhulia and Sakri talukas. There are in all now 116 stud bulls maintained in Dhulia section.

Silage making from green grass.—During the year under report 29 silo pits were filled in North Thana and they were found to be quite successful. In Kolaba 13 trial silo pits were taken round about Badalapur by the end of September and they were opened in May. It was, however, noticed that heavy rains in October had, to some extent spoiled the silage.

2. *Poultry.*—There are 10 poultry farms run by various institutions in this division, for the supply of setting eggs and birds of improved breeds, and these are progressing satisfactorily. During the year under report a large number of setting eggs and birds were given out to cultivators. Following table shows the number of birds and eggs of improvedbreeds distributed :—

Name of the District.	Number of birds supplied.	Number of eggs supplied.	Remarks.
1	2	3	4
East Khandesh	....	168	Birds distributed are mostly of White Leg Horn and Rhode Island Red breeds.
West Khandesh	235	....	
Nasik	39	156	
Thana	9	12	

One hundred and ninety-two setting eggs and 22 birds of improved breed were supplied to 25 persons in 20 villages.

RURAL UPLIFT.

1. *East Khandesh.*—On the system of return with 12½ per cent. interest in kind 61,176 lbs. of seed of wheat strain No. 224 were distributed in East Khandesh. Pusa 4 being not so popular only 1,609 lbs. were given out. In order to supplement organic matter in the soil where Farm Yard manure is not readily available 6,350 lbs. of Sann seed were distributed for green manuring in different villages. 1,491 acres of land were bunded to prevent soil erosion. 328 pigs and 36 Rohis were killed as a measure to combat crop pest.

Bone manure was supplied for 22 citrus gardens worth Rs. 200, 15 gift bulls have been kept for service in Jalgaon, Pachora, Jamner, and Erandol talukas. The Rural Uplift Van visited 11 villages in East Khandesh.

2. *Nasik District.*—In Malegaon section 1,320 acres were bunded to conserve moisture with the help of the grants of the D. V. I. C. Nasik. The Rural Uplift Van visited 8 villages.

3. *Konkan.*—In Palghar area, in order to develop varkas lands, Malies engaged from V. I. C. grants visited 30 villages, grafted 1,025 mango trees and 300 lemon goptees. 100 mango seedlings and 250 cashew-nut and jack fruit plants were raised and distributed free.

At Wada and Bordi poultry farms are being run and advice regarding this subject is being given in all its details. 11,200 lbs. of improved paddy seed was also given in this area and about 30 silo pits were filled with success. Demonstrations of preparing bone manure by burning bones were given.

In Kolaba area work regarding development of three vallies, viz., Patalganga, Kudalika and Ulhas is in progress. The other main activities are, development of varkas lands by distributing seedlings of good quality fruit trees, viz., Mango, cashew-nut, cocum, jack fruit, etc., improvement of poultry by giving Rhode Island breed cocks in selected villages, development of mango nurseries and improvement of cattle by affording facilities to secure pedigree bulls of Dangi breed and buffalo bulls of Pandharpur.

The District Village Improvement Committee has given grants for agricultural improvements to be introduced in rural areas. The schemes relate to Bunding, Horticulture, Poultry, Improvement, Spread of Improved varieties of crops, etc. In addition to this, agricultural knowledge is imparted to the people through the staff and the improved methods advocated. The schemes of rural development such as spread of improved seeds, conservation of soil by bunding, supply of fruit plants, etc., have been continued.

HONORARY AGRICULTURAL AGENTS.

As an aid to the propaganda work of the Agricultural Department 5 progressive cultivators from each taluka of this division were selected this year as honorary workers and they are named an Honorary Agricultural Agents. Classes were held to acquaint them with the departmental activities and improvements and they were given a programme of propaganda work to be carried out in their tract. There is thus a number of village workers who are expected to give valuable help in the spread of the various improvements.

TALUKA AGRICULTURAL DEMONSTRATION CENTRES.

Since this year the Taluka Agricultural Demonstration Centres have been started in 13 places in this division. The names of the centres are given below :—

District.	Name of the Centre.
East Khandesh	1. Waghali.
	2. Mhasawad.
West Khandesh	1. Mohadi.
	2. Taloda.
	3. Malpur.
Nasik	1. Malegaon.
	2. Mangarul.
	3. Adgaon.
	4. Dindori.
Thana	1. Wada.
Kolaba	1. Karambeli.
	2. Sanjan.
	3. Yeranzade.
Total ..	13

In order to show the improved methods of cultivation and to organise a nucleus of production of the seed of the improved crops such centres,

varying from 25 to 30 acres each, have been started. At each centre a kamgar has been stationed whose duties are to demonstrate the various agricultural improvements within a radious of 5 miles from the centre, and to give every help to the cultivators round about.

At the centre he is to guide the various agricultural operations according to the improved methods. He is required to invite the cultivators to the centre and to exhibit to them the standing crops and other items of improvements in the form of charts and samples.

JALGAON COTTON BREEDING RESEARCH SCHEME.

Programme for 1939–40.

I. Isolation of desirable types of cotton (from 120 Dokras selections of last year) for wilt immunity and higher ginning percentage than that of Jarila.

II. Study of the crosses amongst Jarila, N.R. 5 and New Million Dollar.

Crosses :—

(1) F1 (Jarila × N.R. 5) × New Million Dollar.

(2) F2 of (Jarila × N.R. 5).

III. (1) Testing the wilt-resistance of the 3 promising subcultures of Jarila. Six selected plants from these 3 sub-cultures will further be tested by the Plant Pathologist, Poona.

(2) The collection of wilt-free cotton plants from the districts. to be discontinued.

IV. Extensive village trials of Jarila and local cotton in Khandesh.

V. (A new item) Comparative yield trials of Jarila, Banilla and N.R. 6 will be resumed for their yearly performance.

VI. (Item No. V of 1938–39) Laboratory tests of farm and commercial samples of Jarila.

VII. (Item No. VI of 1938–39) Mill tests of the commercial bales of Jarila.

VIII. (Item No. VII of 1938–39) Maintenance of the nucleus of pure seed of Jarila.

JALGAON FARM AGRONOMICAL EXPERIMENTS.

Programme for 1939–40.

I. (1) Experiments continued :—

(1) Sann green manuring to wheat (last year's item No. 3).

(2) Experiments omitted :—

The experiments under items Nos.* (1), (2), (4) and (5) and II (1), (2), (3) of the programme for 1938–39 are to be omitted.

(3) New experiments are to be undertaken only after the careful study of the local requirements of the tract. During this year cotton will be grown for seed multiplication only.

II. *New experiments added in* 1939–40 :

(1) To study the different strains of groundnut received from the Oil Specialist, Coimbatore. This experiment was undertaken by the Cotton Breeder, Jalgaon, during 1938–39, and during this year it will be conducted jointly by the Cotton Breeder, Jalgaon, and the Farm Superintendent.

(2) Trial of Napier grass.

III. Demonstrations and Shows.

BHADGAON FARM AGRONOMICAL EXPERIMENTS.

Programme for 1939–40.

Production and multiplication of Jarila cotton seed on lines of the last year to be continued as :—

I. (1) Production of selfed seed of Jarila cotton amounting to 300 lbs. by selfing 3 lacs of cotton bolls.

(2) Multiplication of 320 lbs. of selfed seed obtained by selfing in 1938–39, on 15 acres on farm controlled area.

II. To record the yields of cotton on the sann green manuring plots of the last year.

III. District trial of Jarila *v.* Local on cultivators' fields under cultivators' conditions.

IV. Use of iron harrow.

V. Demonstration and shows are to be arranged jointly by the Rural Development Department and the Farm. The following demonstrations would be arranged :—

(1) *Rainy season compost making.*—In August 1939.

(2) *Standing crop demonstration.*—In September 1939.

(3) *Demonstration of village trial plot* v/s *local cotton.*—September 1939.

(4) *Winter-weather compost making, iron ploughing, and land development by bunding, levelling etc.*—March 1940.

VI. *New experimental items added in* 1939–40 :—

(1) Precision trial of cotton varieties like Jarila, Banilla and N. R. replicated 8 times in a single strip by randomization.

(2) Trial of Aispuri jowar strain No. 44 against local jowar in single plots of one acre each.

APPENDIX D.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTH CENTRAL DIVISION, POONA, FOR THE YEAR 1938-39.

Charge.—Mr. V. V. Gadgil held charge of this office till November 1938, when he was appointed as Principal Agricultural officer, Sugarcane Research Station, Padegaon. Rao Bahadur V. A. Tamhane, acted as Deputy Director of Agriculture from November 1938 to February 1939 from which date he went on leave. Mr. K. V. JOSHI acted as Deputy Director of Agriculture from February 1939 to 4th May 1939 from which date the whole South Central Division was abolished as a separate unit and was joined to the Southern Division. The Poona Division was perhaps the oldest Division. Mr. K. S. Kulkarny, Deputy Director of Agriculture, Southern Division, thus assumed charge of the old South Central Division from 15th April 1939.

Staff.—Mr. G. P. Patil, Divisional Superintendent of Agriculture, Deccan Canals, acted as Deputy Director of Agriculture, North Central Division, Nasik, from 22nd February 1939 to 3rd May 1939 from which date that Division was also abolished and joined to the Northern Division. Mr. Patil, therefore, reverted as Divisional Superintendent, Deccan Canals, Baramati. Mr. S. B. Jadhav, Superintendent, Kopergaon farm acted as Divisional Superintendent, Deccan Canals during Mr. G. P. Patil's transfer vacancy.

The whole of the District staff was transferred to the Rural Development Department, Government having decided that all propaganda work of the Agricultural Department be handed over to this new Department. This transfer took effect from 15th April 1939. The Bunding Officer, South Central Division, Poona, continued to be under the Deputy Director of Agriculture, Southern Division, until 1st August 1939 when he also went over to the Rural Development Department.

The result of all these transfers was that now this tract of South Deccan has only research work conducted on 3 farms viz. the Kopergaon Farm for sugarcane, the Ratnagiri Farm for paddy and fruits and the small Mohol farm for *rabi Jowar* breeding. Research work would be extended when the proposed trial experimental stations would be sanctioned. A scheme for detailed investigation into the question of Potato for seed purposes is now before Government and if that is sanctioned, work would also be started at Bhandardara and Manchar.

Season.—The season of the year under report was remarkable both for its excesses in quantity and its eccentricity of distribution. Practically all over including Ratnagiri, the anti-monsoon showers were opportune and plenty, thus helping land preparation. It was remarkable that Ratnagiri registered nearly 25 inches rain in 18 hours in the middle of June, this causing large scale washings of soil and seedlings. The *kharif* rains on the plains came in by middle of June and were spread over

everywhere including the usually late rainfall and *rabi* districts of Ahmednagar and Sholapur. To the latter district it was an unusual experience of a *kharif* season. July also gave good rains. August was a bit dry causing a little setback to rice in the Konkan specially the early varieties and in parts of Satara and Poona. Even in this period, Ahmednagar and Sholapur had heavy rains. September and October half gave useful rains but the latter rains proved very troublesome to ripe paddy crops in the transition belt and Konkan and to *Bajri*, groundnuts etc. in the plains. Every district had a very wet year, Sholapur registering nearly double its normal rain. The result of these heavy and erratic rains was far more troublesome than helpful. Paddy in the Ratnagiri District gave only 6-10 anna yields. In the plains the *kharif jowar* gave about 7-8 anna crops due to the early October rains which came at flowering time. *Bajri* suffered much from a wet year giving only 6-10 anna yields. Cottons suffered from too much soil moisture; in fact in Sholapur it was harrowed off in many parts. The yields ranged from 30-50 per cent. of the usual and combined with low market rates, cotton growers had a very bad time. Early groundnuts suffered much in the early October rains and what was expected to be a 12-15 anna yield was thrown down to 8-9 annas. Late varieties suffered less. Low prices, on top, hit farmers much indeed. Potatoes in the Poona and Satara Districts suffered very seriously due to rain at harvest time. Chillies were caught by "Leaf curl" resulting into reduced yields and quantity. *Nachani* did not escape heavy rains at harvest.

The *rabi* crops on the whole fared better. Garden crops were good althrough. Sugarcane yields went up generally and the sudden rise in gul prices helped almost every cane planter to come out of his distressing economic conditions in which he was struggling for some years due to heavy slump in gul-rates.

Another feature which suddenly became a matter of serious anxiety was the large scale attack on sugarcane by grass-hoppers. About 1,500 acres were badly attacked and every one tried almost any remedy they could think of. Various remedies were tried but it appears drawing tarred tin sheets or gunny stretchers smeared with molasses or crude oil was the best and quickest. Rigorous destruction of the eggs laid in soil is the best known remedy to prevent this epidemic and for this it appears the only solution is stopping ratoons and ploughing all the land. Those who followed this advice had very welcome experience in June of 1939.

A. Research.

1. SUGARCANE.

(*a*) *The Kopergaon Farm.*—This is now the Department's chief sugarcane station for the Godavari and Pravara Canals area. Evolved into this position from once a pure fodder farm, this institution, if it is to continue to fulfil this important service, will have to be manned with at least one more graduate assistant and a small laboratory and better

buildings. This is the first year in which the new sugarcane experiments have been started to confirm the results obtained at the Sugarcane Research Station at Padegaon.

(*a*) *Varietial series.*—6 varieties viz., Co. Nos. 419, 290, 413, and 360, P.O.J. 2878 and E. K. 28 were compared in a Fisher's randomized layout with 6 replications. The crop was planted in middle of January and harvested between middle of January to middle of February. Each sub-plot was 0·5 gunthas. Co. 419 was significantly superior to the remaining four varieties. P.O.J. 2878 and E. K. 28 equalled each other but were lower than Co. 360.

(*b*) *Water-cum-manurial series.*—The variety tried was E. K. 28 in randomised plots with 6 replicates. The quantities of water were two viz., 95 acre inches and 130 acre inches. Each had three quantities of nitrogen viz., 225 lbs., 300 lbs. and 375 lbs. Thus there were 6 treatments; each sub-plot was one guntha. The crop was planted at the end of January and harvested in the first half of March. The results show that (1) 375 lbs. Nitrogen is significantly better than 225 lbs. Nitrogen, (2) that 130 acre inches is not significantly superior to 95 acre inches irrigation and (3) that there is no significant difference in the yields with the three different doses of manure with 95 acre inches of water but when 130 acre inches of water are given, 375 lbs. of Nitrogen give significantly higher yields than 225 lbs. Nitrogen. A dose of 300 lbs. Nitrogen shows no significant difference with either.

(*c*) *N.P.K. Series.*—Variety of cane planted was Co. 419. There were six treatments viz. (1) no manure, (2) 225 lbs. Nitrogen, (3) 225 lbs. Nitrogen + 2 cwts. superphosphate (N.P.), (4) 225 lbs. Nitrogen + 2 cwts. superphosphate + 100 lbs. K 20 from sulphate of potash (K.P.N.), (5) same N and P as in (4) but 200 lbs. K20 and (6) same N and P as in (4) but 100 lbs. K20 as muriate of potash. The plan was Fisher's randomised lay out with 6 replication, each plot being one guntha net. The results show that all the manurial treatments are superior to no manure but amongst themselves there is no difference.

(*d*) *Rotational series.*—There are four different rotations viz. (*a*) a three-year rotation (*i*) with plant cane, ratoon and then a fallow year, (*ii*) plant cane, ratoon and cotton in the third year, (*b*) a four year rotation with plant cane, ratoon, cotton and sann green manure in the fourth year and (*c*) a five-year rotation with plant cane, ratoon; cotton, *Bajri* followed by gram and sann green manure in the fifth year. The yields of various crops of this first year have been noted. The results will be available after the rotations are completed. All these are randomised in lay out with 6 replications in each case.

(*e*) *Varieties suitable for Adsali cropping.*—*Adsali* is planted in July and October. For July planting Co s. 419, 413, 290, 360, E. K. 28 and P.O.J. 2878 are being compared. For October planting Co.s 419, 413, 407, 408, 209 and P.O.J. 2878 are being tried. Both crops are yet not harvested. As they stand at present Co. 419 is the best in the July

planting ; 413 showed very unsatisfactory germination. In the October crop also Co. 419 appears leading. All these are randomised layouts with 6 replicates in each case.

(*f*) *A new method of planting.*—Two methods are compared viz., (1) the usual planting at the bottom of each furrow and the second planting on both sides of the ridges. The layout, since it was more of a feeler trial, was in simple single plots of 4 gunthas each. The latter method has given more yield.

(*g*) *Manurial series.*—The idea in this series is to ascertain the proportions of sulphate of ammonia and oil-cakes for the top dressing, the total nitrogen being maintained at 300 lbs. The proportions tried are 1 : 1, 1 : 2, 2 : 1. They are all laid out in Fisher's randomised plan with 6 replications. The result show that no treatment is significantly different from the other. They are all about equal.

District trials.—The Divisional Superintendent of Agriculture Deccan Canals carried out the following trials :—

(*i*) *Varietal.*—P.O.J. 2878, E.K. 28 and Co. 419 were compared with Pundia in cultivators' fields in single plots. Co. 419 giving 16,989 lbs. Gul topped the list. P.O.J. 2878 came next with 149,322 lbs. of gul, E.K. 28 stood third with 12,575 lbs. whereas Pundia stood way down last with 10,132 lbs. gul. The only defect noticed with Co. 419 was that it lodges early and has 1 degree less of brix than the P.O.J. But its higher tonnage compensates for these defects.

(*ii*) *Utility of superphosphate.*—At an extra cost of Rs. 22-8-0 580 lbs. of single superphosphate gave an added yield of 1,840 lbs. valued, at the prevailing rates, at Rs. 150 with P.O.J. 2878.

(*iii*) *Different doses of nitrogen.*—150 lbs. Nitrogen, 200 lbs. Nitrogen and 300 lbs. Nitrogen, as top dressing were tried on E.K. 28. The difference in yields with the two higher doses did not meet the extra cost.

In a varietal trial by the District Agricultural Overseer, Karad, P.O.J. 2,878 gave 1,832 lbs. more gul than Pundia where as E. K. 28 showed practically no difference. But the hardness of P.O.J. is in its way of spread among small cane-growers who have only bullock power crushers.

The area under improved sugarcane varieties has increased by leaps and bounds. It is apparent that due to a general awakening among planters and due to competitive presence of sugar factories on the Deccan Canals, the work of introducing improved varieties has now become almost automatic. Co. 419 is spreading very widely indeed. It is estimated that under improved varieties—

(*a*) the seven sugar factories have in all about 16,000 acres.

and

(*b*) among cultivators this acreage has gone up to at least about 17,075 acres.

2. RICE.

Ratnagiri Farm.—The only farm where work on this crop is being done to a small extent is the one at Ratnagiri. The main work on this farm now is (*a*) to maintain in a pure condition the higher yielding strains already evolved and (*b*) to multiply pure seed of these strains for distribution among farmers. During the year under report 2,880 lbs. of Patni 6 (early coarse), 2,478 lbs. of Panvel 61 and 2,043 lbs. of Waksal 207 (intermediate medium), 308 lbs. of Kolamba 184 and 2,563 of Kolamba 401 (intermediate fine) and 409 lbs. of Bhadas 79 (late coarse) seeds were produced for distribution.

Kudai 25, selection 17-23 and 4-7 from crosses between Patni 6 and Kolamba 79 have been discarded.

District trials.—Kolamba 540 and 501 were compared on cultivators' field by the District Agricultural Overseer, Ahmednagar in the Akola taluka with the local Jirval variety. The former gave about 175 lbs. more and the latter about 100 lbs. more paddy than the local per acre. Kolamba 501 when compared with local Patni in the Patan taluka (Satara) gave 256 lbs. more paddy.

3. WHEAT.

Wheat strain No. 808 (Bansipalli) was compared in 5 villages with the local Sudha variety in Ahmednagar. The difference between the two on the average was just about 25 lbs. per acre.

Pusa 4, Pusa 111 and Bansipalli 808 tried in Khed in the Poona district showed that whereas the last one gave 650 lbs. per acre, the first one gave 800 lbs. and the second one 850 lbs. grain. Pusa 111 gave 126 lbs. more grain whereas Pusa 4 gave about 145 lbs. more grain when compared with spelt wheat in the Karad tract.

Pusa 4 when compared with local wheat in the Wai-Mahableshwar tract in 4 villages gave under irrigation about 40 per cent. and under dry conditions about 15 per cent. more grain.

In the Deccan Canals tract Pusa 4 and 111, Bansipalli 808 were compared with local Kathya variety. Whereas Kathya gave 686 lbs. grain, No. 808 gave 630 lbs., Pusa 4-832 lbs. and Pusa 111-915 lbs. In a trial of green manuring for wheat, Pusa 111 gave a higher grain yield of 448 lbs. giving a net profit of Rs. 35 per acre.

4. JOWAR.

Mohol Farm.—The only farm on which breeding work on *jowar* (*rabi*) is carried on is the one at Mohol in the Sholapur District.

(*a*) *Maldandi strains.*—Strains 35-1, 47-3, M.9 were compared with local in Fisher's randomised plots with 4 replications on one guntha size sub-plots. The results show that 35-1 has stood superior to all, the difference between the other three being not significant.

(*b*) *Market valuation of Maldandi strains.*—M 35-1 was offered 11·5 per cent. more price while the other two 6·5 per cent. more than the local.

(*c*) *Dagadi jowar strains.*—Strains 15 of Nagar Dagadi was compared with Nagar local Dagadi and strains 24,34,39 of Bijapur Dagadi were compared with Bijapur local Dagadi. Nagar Dagadi—15 gave definitely higher yields than Nagar local Dagadi whereas the Bijapur *jowars* showed no significant differences.

(*d*) *Graded seeds :* In a study to see the effect of grading *jowar* seed with a sieve and sowing only bigger sized seeds, when equal seed rate (5 lbs.) was given by weight, the local ungraded seed gave 15 per cent. more yield while even the ' rejected ' seed gave 10 per cent. increase. Perhaps the larger population in the local and rejected coupled with a good *rabi* season was responsible for this.

(*e*) *Districts trials.*—Tried in the Deccan Canals area the Maldandi strains 35-1 and 47-3 yielded about 22 per cent. and 12 per cent. more grain and 14 per cent. more fodder under irrigation.

Sann green manuring gave 50 per cent. more grain and about 40 per cent. more fodder in a trial with local irrigated *jowar.*

Tried on the Kopergaon Farm M 47-3 gave less yields of grain and of fodder than the local.

The trials in Ahamednagar District (dry areas) showed that M 35 gave about 25 per cent. more grain than local. In the Wai and Khatav side of Satara district, strain 35-1 gave, on an average of 8 trials under irrigation increased grain yield of 22 per cent.

Wider sowing.—In dry tracts, wider sowing is recommended for *rabi jowar.* District trials carried out in South Satara showed that as against the local spacing of 12″ between lines 15″ gave about 28 per cent. more grain, 18″ against 12″ gave 35 per cent. more and 24″ against 15″ gave about 40 per cent. more grain per acre. Similar trials in the dry areas of Ahamednagar in 9 villages showed that 16″ between lines in every case gave very appreciably higher yields both in grain as well as fodder over the usual 12″ spacing.

5. BAJRI.

The work on this crop is confined to district trials of Akola seed in farmers fields. Trials with this seed in the Ahamednagar district (non-canal tract) in 5 trials in 5 different villages gave consistently good higher yields whether grown as a dry crop or irrigated. In the Khatav and Man tracts of Satara, Akola seed gave consistently higher yields than the local ranging from 8 per cent. to 33 per cent. in 13 trials in as many different villages whether as dry or irrigated crops. In the Deccan Canals area, Akola seed gave about 32 per cent. more grain yield over the local.

6. GROUNDNUT.

Work on this crop was confined to varietal trials. On the Kopergaon Farm, was laid out a systematic Latin Square experiment for trial of 4 selections sent by the Oil Seed Specialist, Coimbatore, as compared with Kopergaon selection No. 1 in 5 replications. The results show that selection A.H. 113 (West African), A.H. 186 (Caroline) and Kopergaon I were equal to one another and all these significantly superior to A. 186 (Bassi) and A.H. 447 (Bassi).

District Trials.—In the Deccan Canals area, Kopergaon No. 1 and No. 3 were when compared with Spanish Peanut gave 23 and 40 per cent. respectively higher yields. In South Satara K 1 gave on an average of 5 trials about 14 per cent. more yield than the local. In the non-canal parts of Ahmednagar district, K 1 gave consistently higher yields varying from 240 lbs. to 2,400 lbs. as an irrigated crop in 30 different trials in 3 villages.

7. COTTON.

Varietal trials.—In the Deccan Canals area, Banilla, Jarilla and B.D. 8 (from Gujarat) were tried in farmers fields under irrigation. Jarilla gave 1,084 lbs. seed cotton, Banilla 612 lbs. and B.D. 8, 670 lbs. Wherever wilt was prominent, Jarilla always gave much higher yields than Banilla. On the Kopergaon farm, Banilla gave an average return of 534 lbs. per acre only. In the non-canal tract of Ahmednagar the yields of Banilla under irrigation varied from 434 to 894 lbs. as against 362 lbs. to 772 lbs. of the *Deshi* cotton, the increased yields of the former ranging from 54 lbs. to 122 lbs. seed cotton. In the Sholapur tract, cotton suffered due to heavy rains and so the results were rather vitiated. As they stand however Banilla showed no advantage whereas Jarilla in one out of three trials gave 30 per cent. more yield while in the other two there was not much difference.

In Tasgaon in South Satara, Jayawant was compared with local Kumta in 6 different places and the average increased yield of Jayawant was about 12-13 per cent. except in one case where no difference was seen. The quality however of Jayawant gives more money.

8. OTHER EXPERIMENTS.

Ran-Matki (Phaseolus Trilobus) was tried on the Kopergaon farm as a green manure for *rabi jowar* and compared with no manure and additions of Farm Yard manure on single plots as a feeler trial. The results show that 20 carts farm yard manure gave 2,830 lbs. of *jowar* grain per acre. Ran Matki green manure gave 2,460 lbs. grain, Ran Matki green manure plus 20 carts farm yard manure gave only 2,330 lbs. whereas no manure gave 2,230 lbs. grain per acre. Ran Matki produced 6,700 lbs. green matter per acre. It is apparent that green manuring with Ran Matki is quite useful. The other two treatments with farm yard manure would be costlier.

Tried as a crop on the Mohol Farm, Ran Matki gave on half an acre 2,243 lbs. green fodder, 2,205 lbs. dry fodder and 43 lbs. seed.

Patada Shevara.—(Alysicarpus belgaumensis) was also tried as a green manure, part of the crop was weeded and part not weeded. In the former the total green matter came to 8,819 lbs. (2,183 Patada Shevara plus 6,036 weeds) whereas in the weeded plot this came to 5,079 lbs. The unweeded plot gave more grain (21 lbs.) and fodder (84 lbs.) than the weeded plot. These differences are negligible.

Sann Hemp crop for fibre.—A scheme sanctioned by the Imperial Council of Agricultural Research to see if higher yields and better quality of fibre could be obtained by various treatments such as *rabbing*, early sowing, different seed rates etc. was started at Kondye in the Rajapur taluka and Baparde in the Deogad taluka in Ratnagiri. The *kharif* season was abnormal, some of the crops failed utterly and thus the results were practically lost.

9. FRUITS AND NURSERIES.

It is on the Ratnagiri Farm that an interesting attempt is being made to study the possibilities of increased outturns from higher lying lands by adopting fruit cultivation other than the mango which is an old established crop.

Pine-apples grow successfully. The Kew and Queen grow very well and there is a good and increasing local demand for fruits and suckers. 30 gunthas were under the Kew and 8 gunthas under the Queen variety. It has been decided to increase these to 48 and 12 gunthas respectively to meet increasing demands for suckers. The real harvest season, as at present, comes off in the rainy season and as such fruits do not fetch handsome price, as transport to mofussil markets like Bombay by road is very costly. Trials will be done to see if by change in the planting season, the harvest could be brought on between November to February.

Santra, Mosumbi and guava trees have now finished 4 years and ready for Bahar treatment. Growth so far is excellent. Their performance as regards yields and quality of fruit etc. will be watched from 1939 onwards. Chikoos have grown well and yielded a small starting crop with good quality of fruit. Limes are doing well. Italian lemons yielded profusely. Out of different grape varieties only Bhokri has been doing well and yielded 7-8 bunches per plant in the coastal conditions. It is hoped it will succeed further. Pomegranate (selection G.B.I) plants are so far growing well. Mangoes yielded bumper crops this year. One old big Alphonso tree fetched Rs. 92-0-0. The total sale of all fruits etc. put together came to Rs. 823-0-0 of which pine apples alone brought 560-0-0.

Cocoa (3) and Tung oil plants (18) grown for trial have made satisfactory progress. Cocoas however are growing very slowly. 20 more Tung oil plants on hand would be put in in 1939.

The nursery is becoming increasingly popular. Various grafts, plants, suckers, etc., sold fetched Rs. 823-0-0 against a maintenance cost of Rs. 150-0-0.

A variety of vegetables notably cabbages, knolkhols, etc., were grown and they did fairly well.

B. Education.

A new educational activity consisted this year of the undertaking of bunding classes for the farmers. Seven such classes were conducted (in important villages) 2 in the Poona district, 2 in Ahamednagar, 2 in Sholapur and 1 in Satara.

The classes were of 10-12 days' duration. In all 325 farmers took the training. With the aid of these students 7 model schemes were actually got constructed. This was a very welcome feature. These schemes are along principal roads and so should serve as good demonstrations to farmers. It is understood that of the number trained 194 persons have actually done land-development on their own lands. Fifteen more students took the more intensive and higher land development training at the Central Class at the Poona Agricultural College.

Other classes.—17 primary school teachers of the districts of Ratnagiri, Thana, Kolaba and Bombay Suburban were given practical training in agriculture and horticulture for 4½ months on the Ratnagiri Farm.

15 persons were trained in budding and grafting and 25 in mango-canning on the Ratnagiri Farm in December and May 1938 respectively.

C. Propaganda.

Bunding Work.—Owing to the Bunding Officer having been engaged during a major part of the year on bunding class newly organised he could not devote the required time towards disposal of applications for bunding schemes. Out of a total 190 applications from the 4 districts of Poona, Satara, Sholapur and Ahamednagar asking for Rs. 57,970 as Tagavi loan for land development work only 35 for Rs. 6,335 could be disposed off. Similarly out of total of 303 applications for land development advice from private individuals only 61 could be actually helped leaving on hand 242 yet unattended to. Such applicants if not helped in time spend their money on other things and extension of land developments lags behind. Of the 75 schemes for which plans, etc. were supplied so far at an estimated expenditure of Rs. 29,400 only 13 were actually constructed at a total cost of Rs. 3,425 for an approximate area of 162 acres.

It would be clear from these figures that though the last figures of actually constructed works are not very big, the damping of the enthusiasm due to non-attention to applications is very considerable indeed. Independent and extended staff on this work is badly needed to cope with this all important work to continue and increase the progress of such works of great national utility. Besides the above the Bunding Officer helped the Village Improvement Committees of all the 4 districts by supervising the work of the Bunding Sub-Overseers.

Taluka Development Associations.—The District Staff helped all the Associations in their propaganda work as usual and speaking generally there has been a greater enthusiasm in their works.

The Deccan Agricultural Association.—The District Agricultural Overseer, Poona, continued to help the Association in its agricultural improvement activities.

Sugar Factories.—The six factories in the Deccan Canal area continued to work quite satisfactorily. They along with all cane planters, had an extremely good year on account of the rise in gul and sugar prices. This prosperous year has given an impetus to this industry with the result that two more factories are expected to start work in the Ahmednagar district. In fact one—The Kotak Sugar Factory has already begun planting their June-July adsali crop while the other the Changdeo Sugar Factory is being quickly organised. The Maharastra Sugar Factory at Belapur had very anxious times due to a sudden grasshopper plague and fully co-operated with us in the protective and destructive measures. They themselves spent a good deal of money against this great scourge.

Village Improvement Committees.—The District Staff gave all possible help to the various committees.

Taluka Demonstration-Centres.—This was a new activity this year.

(1) *Vaduj (Satara).*—The main items taken up were Akola *bajri*, Kopargaon No. 1 and 3 groundnuts, strain M 31 of *rabi jowar* and Pussa 111 wheat, green manuring for *rabi* crops and a small area under dry farming. The yields of all these crops were satisfactory. This centre attracted attention of neighbouring farmers and earned their appreciation.

(2) and (3) *Umbraj and Tasgaon (Satara).*—Owners Messrs. D. R. Harshe and S. A. Pawar respectively. Areas 32 and 29·5 acres respectively. It was only at Umbraj that improved farming could be carried out and the results were much appreciated by a number of farmers around.

(4) and (5) *Kankavli and Deorukh (Ratnagiri).*—Improved types of paddy and nagli were the main items taken up. About 1,000 farmers saw these centres.

(6) and (7) *Kondapuri* (*Sirur*) *and Khed* (*Poona*).—Dry farming methods were mainly adopted at Kondapuri while at Khed Akola *bajri*, improved tomatoes, Pusa wheats, wheat No. 808, chillies, onions and a number of other vegetables were grown. A very big demonstration was held to show the farmers the work on this farm.

(8) *Shevgaon* (*Ahmednagar*).—Area 30 acres. Improved crops like Banilla cotton, groundnute, *bajri* and vegetables were grown but owing to severe floods and a very wet year, the object of this centre could not be achieved.

General.—The volume and nature of work done by the district staff is shown in the acompanying statement.

K. S. KULKARNY,

Dharwar, 31st August 1939. Deputy Director of Agriculture,
Southern Division, Dharwar.

The results of propaganda work by District Agricultural Overseers following

Items.	Poona.	Satara.		Ahmednagar.	
		Satara.	Karad.	Nagar.	Shrigonda.
Seeds—					
Improved Jowars (lbs.)	..	2,402	202	5,880	9,119
Do. Wheats (lbs.)	4,537	7,574	3,730	8,260	4,635
Do. Bajri (Akola) (lbs.) ..	1,000	1,583	1,044	4,400	4
Do. Cotton (lbs.)	800	..	21,582	64,280	3,828
Do. Paddy (lbs.)	..	728	902	..	..
Do. Groundnut pods (lbs.) ..	3,000	10,963	8,525	5,516	558
Do. Vegetables (Rs). ..	200	..	30	..	42
Do. Nagali (lbs.)	..	..	219	..	..
Do. Sugarcane sets (Nos.) ..	29,850	..	54,000	..	..
Potatoes (lbs.)	..	7,360	2,084	..	..
Others (lbs.)	..	1,200	..	..	..
Seed grading—					
Jowar, Bajri and wheat (lbs.) ..	19,466	1,08,587	..	30,000	1,800
Manures—					
Artificials (lbs.)	..	16,434	..	31,556	1,648
Oil cakes (lbs.)	..	11,580	..	..	..
Others (lbs.)	..	..	..	..	..
Sann green manure seeds (lbs.) ..	..	484	..	720	320
Fruit trees and flower plants—					
Plants, grafts, seedlings	25,000	4,425	2,477	4,150	1,020
Insecticides and fungoides—					
Sulphur packets	1,500	6,313	2,676	..	766
Sulphur dust	..	..	..	..	..
Areas sprayed, etc. (acres)	2,898	237	..	..	..
Supplied others (lbs.)	..	530	..	..	..
Implements, etc. sold (Rs.)	660	..	..	4,000	..
Hired from Depots	226	..	..	..	..

in the South Central Division during 1938-39 are summarised in the statement.

Sholapur.	Ratnagiri.	Deccan Canals.	Total.	Remarks.
36,084	....	10,000	68,087	
5,478	....	44,000	78,214	
687	....	21,500	30,218	
1,987	....	85,000	1,77,477	
..	1,50,000	3,000	1,54,630	
1,122	....	19,000	48,084	
144	....	....	416	
..	....	....	219	
..	15,000	11,05,350	12,94,200	
13,966	....	....	23,360	
330	500	10,125	12,155	
84,700	....	75,000	2,92,553	
13,153	8,85,800	76,91,120	86,39,711	
..	....	10,08,00,000	10,08,11,580	
..	....	....	....	
796	....	2,50,000	2,52,320	
3,366	1,050	9,736	51,224	
3,137	....	11,320	25,712	
..	50,000	934	50,934	
..	....	....	3,135	
177	....	1,179	1,886	
11	30	206	4,007	
..	....	350	576	

Items.	Poona.	Satara.		Ahmednagar.	
		Satara.	Karad.	Nagar.	Shri-gonda.
Dry farming (total up-to-now)—					
Spread of all parts (acres)	4,500	..	..	..	..
Katcha bunds only (acres)	15,000	..	..	..	175
Wider sowing (acres)	1,500	..	..	..	1,200
Live stock—					
Bulls supervised	..	49	..	..	..
Poultry given	32	34	..	..	..
Eggs given	..	348	..	..	..
Shows demonstrations—					
Cattle	..	2	..	..	..
Crops	..	57	46	130	..
Implements	..				
Talks	30				
Plots worked	..	121	..	138	..
Classes—					
Conducted	1	..	..	..	..
Agril examined	5	All	..	..	..
Bunding	..	1	1	..	1
T. D. A.'s supervised	8	All	5	7	..
Other societies helped	3	..	..	2	..
Taluka Demonstration centre conducted ..	2	1	2	1	..
V. I. Committee's work	Yes	Yes	..	Yes	..
Gun club helped and organised ..	..	4	..	..	..
Regulated markets supervised ..	..	..	..	..	..

Sholapur.	Ratnagiri.	Deccan Canals.	Total.	Remarks.
25,000	....	....	29,500	
....	....	....	15,175	
....	....	....	2,700	
....	....	....	49	
....	....	....	66	
....	....	....	348	
....	....	....	2	
191	90	72 105	741	
....	135	637	1,051	
1	....	....	2	
All	....	....	....	
2	....	....	5	
....	All	7	All	
....	....	....	5	
....	2	3	11	
Yes	Yes	....	....	
....	....	....	4	
....	....	1	1	

K. S. KULKARNY,
Deputy Director of Agriculture,
Southern Division, Dharwar.

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APPENDIX E.

Summary of work done under the Deputy Director of Agriculture, Southern Division, Dharwar, for the Year 1938-39.

(A) Staff.

The charge of the Southern Division, as it was known until the reorganisation of the Agricultural and the new Rural Development departments and as it comprised of the four districts of Belgaum, Dharwar, Bijapur and Kanara, was held by Rao Bahadur S. S. Salimath till the 6th January 1939 from which date he proceeded on 8 months' leave on medical grounds. Mr. V. C. Pavate, Cotton Superintendent, S.M.C., held charge of the current duties of this office from 6th January 1939 to 24th February 1939 both days inclusive in addition to his own duties and Mr. K. S. Kulkarny, Assistant Professor of Agriculture took over as officiating Deputy Director of Agriculture from the 25th February 1939.

Rao Saheb G. L. Kottur, Cotton Breeder, S.M.C., Dharwar, suddenly died after a brief illness on 16th March 1939. His long excellent work produced many earlier selections in the Kumta and Dharwar-American Cottons and finally the now widely distributed and highly appreciated Jayawant and Gadag I, as also very useful selected strains of (*a*) local Jowars like the Fulgar white No. 47-3, Bilchigan No. 4, Nandyal 5-3, (*b*) Groundnuts like the pandichery No. 8 Spanish pean-nut No. 5 and improved spanish pea-nut, (*c*) gram like the wilt resistant strain No. 18-12. Each of these selections is definitely superior in yield and quality to the local variety. He had on hand some more cotton selections like the New Jayawant, the early Jayawant, hopeful cross between cambodia and Gadag I, etc., etc. His sudden demise has caused a wide gap which would long take to fill. A hard working, amiable, social and generous officer has been lost. Mr. S. S. Maralihalli, Assistant to the Cotton Breeder, is now officiating Cotton Breeder, pending final orders. Mr. D. M. Kulkarni, District Agricultural Overseer, Belgaum, was on leave on medical grounds from 19th January 1939 to 10th June 1939. Mr. S. R. Katti, Agricultural Overseer, Haveri, was on leave for two months from 25th January 1939 to 24th March 1939. There were no other more major happenings.

The reorganisation of the two departments has caused a very great and drastic change both in the personnel as also the nature of work from 15th April 1939. A number of internal transfers of graduate, non-graduate, clerical and lower staff were made from the end of March 1939, in order to retain in the Agricultural Department such officers as were more suitable for research, investigation and educational work which now forms the only line of work for the Agricultural Department and to put officers more inclined towards propaganda work in the propaganda line to be ultimately passed on to the new Rural Development Department. The staff of the Southern Division of the Agricultural Department

after the 15th April 1939 has thus been reduced considerably leaving what may be called the very bearest minimum to carry on the research work and administrative work in hand. So cut-down has been the farm staff that it is very difficult now to fill up even a leave vacancy with men with experience as used to be possible before by internal transfer of district workers. The whole cotton staff including the Cotton Superintendent, S.M.C., has also gone over to the Rural Development Department but the actual transfer occurred as recently as by the end of June 1939. The Deputy Director of Agriculture's office has suffered the greatest in that many of the experienced clerical hands went over to the R.D.D. as somehow they belonged to the old class of clerk—fieldmen later put in the general list of agricultural sub-overseers, and the staff was cut down from nine hands to five leaving a large pile of arrears to clear which it has been a great uphill task even until August because even with the transfer of propaganda staff, the work of the " transition " period continues yet besides the sudden addition of the work of old S.C.D. which has been abolished. The office therefore had the most difficult and worrying time all these 4 or 5 months.

The new Southern Division now extends over 9 districts instead of 4. Three more farms have been added due to this, viz., the farms at Kopargaon in the Ahmednagar district, at Mohol in the Sholapur district and the one at Ratnagiri.

(B) Season.

The Season in the area of the old Southern Division was one that could be considered as satisfactory on the whole except that Bijapur had an unusually wet year and the transition paddy belt of west Dharwar and contiguous part of Belgaum a very dry time. Anti-monsoon showers in April and May were received almost all over except the Southern half of Bijapur where it pushed the kharif sowing forward by over a fortnight. June and July gave good rainfall everywhere. August and September also gave no cause for anxiety anywhere except the transition paddy belt of west Dharwar where these months proved too dry for paddy the only staple crop. This tract has had a very bad time for over 5 years continuously. August was also rather less rainy than it should be in Kanara and this had a check on paddy growth. October also gave good rains in its first part. After the middle of October there were no rains anywhere in the Division. This caused a little setback to specially to Jowar in some parts and hastened its harvest. Dry eastern winds in the harvest time of the cottons brought an earlier harvest and a slight fall in quality. Bijapur which is proverbially a scarcity area and predominantly *rabi* was changed into one of plenty of rain and conspicuously kharif, though due to excess of rain most kharif crops had a bad time.

The Paddy crop in Kanara also suffered from the " Kane " pest which caused same damage. So also did the paddy crop in the west Dharwar transition paddy belt from insects. These pests unusually take a sudden

start in dry weather like what happened in August almost all over the paddy tract. Yield of kharif Jowar on the whole ranged from 70-80 per cent., Bajri from 50-70 per cent. cotton about normal, chillies about 70-85 per cent. Rabi crops gave almost normal yields all through. Fodder and grazing were enough. The economic condition of the farmers was what might be called steady except that Cotton growers lost on account of low prices and sugarcane growers gained due to unexpectedly high rates.

(C) Research and Investigations.

I. COTTON—COTTON BREEDER'S SECTION.

(*a*) Kumta Cotton.

Trial of selected strains against local Kumta.—Four selected strains, viz., Jayawant, New Jayawant, early Jayawant and Dharwar No. 2 were compared with local Kumta in fisher's randomised method. In yield of *Kapas* Jayawant gave 15·4 per cent. more than Kumta and 27·5 per cent. more than New Jayawant and beat Dharwar No. 2 also even better than it has done Kumta. Early Jayawant yielded the last. The new Jayawant and early Jayawant however have higher ginning (30·6 and 33·0 respectively) over Jayawant (28·5) Jayawant however gave the highest lint recovery and lowest wilt incidence (0·7 per cent.) as compared to the others which showed a susceptibility varying from 2·05 to 5·7 per cent. In this series of trials therefore, Jayawant stands best in every way. The above superiority of Jayawant over others is significant.

In other series however, early Jayawant stood superior to Jayawant and New Jayawant but these trials are not significantly decisive. The early Jayawant and New Jayawant are 2 types of a Jayawant X 15 cross.

Other promising strains on hand.—(*a*) selections 1-4-2, 6-2-4, 8-1-2 out of the cross (IA-14-3) X (DI X D 2 1-0-1) in the 6th generation were further tested for purity and the following, viz., 1-4-2-4, 6-2-2-3, 6-2-4-5 and 8-1-4-1 appear promising as they have higher ginning (35 per cent.) and possess at 25 m.m. staple. These will be further tested.

(*b*) selections 6-4 and 9-1 and 10-2 out of the cross (Jayawant X N 14) X (IA-14-3) in their fifth generation were further tested and the following, viz., 6-4-1, 9-1-3 and 10-2-2 have been selected for further tests. They gin to 33 per cent. and possess at 25 m.m. staple.

(*c*) Besides the above, 8 other strains have been maintained as reserve material. All these are pure, gin from 24 to 36 per cent. and have a 25 m.m. staple. Ginners below 33 will be however discarded.

Wilt resistance.—Tested in the wilt-infected plot, the 12 different cottons showed wilt percentages as shown in the bracket against each name: Dharwar I (37·5), Dharwar II (5·5), Jayawant (3·0),

K.W.R. (2·1), Kumta Farm (2·5), K.B. 7-6-T 12-2 (0), K.F.T. 12-2-5 (0), K.F.T. 14-3-11 (0), New Jayawant (3-6), Wagale (3·5), Comilla (1·4), Verum late 3·2 (5·7) and N 14 (86·7).

Tested in the green house M.D.T. 2, K.F.T. 12 and K.F.T. 14 gave 100 per cent. wilt resistance though all showed leaf mottling. K.F.T. 14-3-5-3-4 and K.F.T. 14-3-11-6-1 show less mottling than K.F.T. 12. So far not a plant has been found to have absolutely no mottling of cotyledon leaves.

Inheritance of wilt resistance.—This work is in the F·2 stage and will be continued for more light.

Selfed seed.—481 lbs. of selfed seed of Jayawant produced on the Dharwar Farm and 330 lbs. of selfed Gadag I seed produced on the hired plot at Gadag were given over for further multiplication.

(*b*) American Cottons.

The selected strains from the cross between Gadag I and Cambodia (Co. II) were tested both at Dharwar on single plot and at Gadag in randomised replicate. At Dharwar, they all suffered from jassids, thrips and apphis and " red-leaf " except strains 4-4-1, 9-7-6 which were free from red-leaf trouble. Strains 4-4-1, 9-7-6 and 12-6-3 yielded better than Gadag I and will be tried next year. At Gadag, i.e., in the real American Cotton tract, 4-4 yielded 25·7 per cent. higher than Gadag I and 12-6 gave 8·3 per cent. higher yield than Gadag I whereas 9-7 yielded less seed cotton this year. All these will be further tested and their spinning test results awaited. Some more selections with 35 per cent. ginning have been made.

Spinning test.—10 samples of improved strains were sent to the Technological Laboratory for spinning tests. The results show that Jayawant stands the best of all so far as staple length and counts (405) are concerned K.F.T. 12-2-6 come a close second in staple and equal in counts and Jayawant X 15-11-0-1-4-5-1 a close third in staple and equal in counts. The rest are lower down. GI X Co. II-4-4 is even better in staple to Gadag I and equal in counts.

Russian Cottons.—These are all late, lower ginners and shorter stapled (22 m.m.). They are however, being maintained for some of their red-bolls and khaki cotton.

Dharwar Farm.—Four selected strains of cotton, viz., D1, D2, Jayawant and Jayawant X 15 were compared with Kumta on the Dharwar Farm. Jayawant, Jayawant X 15 D 1 and Kumta show no differences and are superior to D1.

Arbhavi Farm.—Two cottons, viz., Cambodia and Gadag I X Co. 2 were tried for their yields. This year however the former yielded slightly more (54 lbs.) than the latter.

District trials of cottons.—Jayawant, Kumta and New Jayawant cottons were tried under the Cotton Superintendent, S.M.C., on farmers' fields in various centres, in Dharwar, Belgaum and Bijapur districts. The total number of trials done were 119 in 24 villages. The average results show that Kumta gave 326 lbs., Jayawant 357 lbs. and New Jayawant 360 lbs. of Kapas per acre.

Similarly Gadag I was compared with local Dharwar-American in Gadag and Ron Talukas in 44 trials in 8 villages. The average results show that Dharwar-American gave 247 lbs. and Gadag I gave 279 lbs. of Kapas per acre.

At the Gadag seed multiplication plot 3 new strains were compared with Gadag I in Fisher's randomised plots in six replications. The results show that Gadag I gave 440 lbs., Gadag I X Co. II 4-4 gave 553 lbs., Gadag I X Co. II 9-7 gave 420 lbs. and Gadag I X Co. II 12-6 gave 480 lbs. Kapas per acre.

Further trials of these strains will be done in 1939-40.

II. PADDY.

(*a*) Mugad Rice Breeding Station.

(*a*) *Dodgaya strains.*—7 strains were compared with local Belgaum rice as a check. Strains 5-1-1 stood superior to the others as in 1936-37 but contrary to 1937-38.

(*b*) *Trial of some non-Bombay rices.*—This was the fourth year of this work. 5 promising such rices were compared with Mugad 141 and *Sannabhatta* a local fine variety. Indrasal, Luchai have again stood superior of *Sanna bhatta* whereas Georgesal and G E B 24 also gave superior yields in direct position to their performance in all the previous 3 years. As compared to M 141, none of these rices gave higher yields but only Luchia has yielded equal to M 141. In another services Luchai stood superior to M 141. The four years' work shows Luchai could be a good fine rice substitute for M 141 in low lands. This trial would be done for a year more.

(*c*) *New selections from Dodgaya rice.*—36 of last year's selections were further tested and 18 have been kept for trial in 1939-40.

(*d*) *Selections in local fine rices.*—3 very early, 5 early, 11 midlate, 12 late and very late types selected in 1937-38 were tried in the year under report and of these 3, 4, 7 and 9 and 11 respectively out of the above have been further selected for trial in 1939-40. The earliness or lateness is based on the time taken for flowering with a difference of 10 days for each of the above 5 classes.

(*e*) *Antersal No. 200.*—This strain has a defect of hollow seeds at the top of the panicle. To see if any other strains of Antersal could be found to remove this defect. Five other strains were tried. None of these gave any yields superior to A 200 but A 176 has given an equal yield. This trial will be repeated.

(*f*) *Purple paddy.*—To facilitate Gonag irradication from Rice fields, a purple variety was compared with M 161. But M 161 beats this severely in yield. This trial will therefore be dropped.

(*g*) *Sindh varieties.*—Six Sindh varieties were compared with M 141. All gave far less yields and so this trial will be dropped.

(*h*) *District trials.*—The different paddy strains evolved at Mugad were compared in farmer's fields by the Overseer at Bailhongal in 3 villages. Mugad Nos. 161, 249, 81 and 141 gave 11, 10, 6·6 and 12 per cent. higher yields respectively while Antarsal strains Nos. 67, 200, and 90 gave 5·5, 12 and 8·7 per cent. higher yields than the locals.

(*b*) Kumta Farm.

(*a*) *Earlies.*—Maskaty No. 1315 (Early) was compared a second time with 2 early varieties, namely, Ajaga and Bile-Akka. The results show that Ajaga is definitely inferior whereas Bile-Akka is about equal in grain yield and superior in straw yield as compared to Maskaty 1,315, whereas all these three are equally early.

(*b*) *Maskaty* 1,315 v. *Maskaty* 1,012.—Both in yield of grain as well as straw No. 1,315 is definitely better. During the three years of this trial No. 1012 stood superior only in one year.

(*c*) *Maskaty* 1,315 v. *Rajakavam and Tavalakavam.*—To this trial in its second year, a variety Rangoon was added this year. The results show that (*a*) 1,315 is the earliest, (*b*) Tavalakavam has given 16 per cent. more grain and 19 per cent. more straw. Rangoon also did slightly better. Rajakavam is definitely inferior.

B. Midlates.

(*a*) *Strain Jeddu 1,061.*—compared with Jeddu strains 80, 83 and Arya 99, showed, as opposite of last year, that it was equal to strain 99 and poorer than the others. Heavy lodging when in milk has caused No. 1,061 to go down this year. When No. 1,061 was compared with local Jeddu, it gave 25 per cent. more grain and about equal straw. This agrees with the results of previous years.

C. Lates.

(*a*) *Red Halga No. 244.*—When compared with local varieties, viz., Halga and Muginbeldu, No. 244 gave 13·7 per cent. more grain and 26·2 more straw over local Halga and 20 per cent. more grain and 4 per cent. more straw over Muginbeldu. These results confirm last year's results.

(*b*) *Muginbeldu strains.*—Seven selected strains were further tested with the local and Red Halga 244. The results show that, as regards grain yields, all these strains yielded from 28 to 55 per cent. more than the local but far lower than Red Halga 244 as against more promising results of last year. This was due to *Kaune* pest. On the whole, however, strains 230, 159, 169 and 77 appear very promising.

(*c*) *Upghat white Halga.*—Last year's six strains were further tested with local Halga. The results in general indicate that all these are better yielders giving from 11 to 64 per cent. higher grain but Nos. 802, 960, 1,681, 1,990 and 1,691 give significant increases. As regards straw all give higher but as 960, 1,670, and 1,691 gave significant increases.

(*d*) *Mugad strains.*—A few Mugad strains tested here for few years show that these have little chance in the Kanara coastal tract as they are very severely attacked by *Kanne* pest.

(*e*) *District trials : Strain Muskati No. 1,315.*—On the farm this gave 13·3 per cent. more yield than the local Muskaty whereas in the districts the extra yields varied from 3 to 9·8 per cent., i.e. an average of 4·4 per cent. meaning about 84 lbs. paddy or Rs. 2-4-0 per acre as a net profit by use of this seed alone. It is seen that this strain requires optimum conditions of soil and water to give the best results and so is more suited for Kumta, Honavar and Bhatkal side rather than Ankola and Karwar where soils are coarser and broadcast sowing is the rule.

(*f*) *Strain Jeddu 1,061.*—In district trials this gave higher yields, over local varieties, ranging from 6·6 to 25 per cent. i.e., an average of 12·3 per. cent. meaning about 252 lbs. of paddy or Rs. 6-12-0 per acre.

(*g*) *Strain Red Halga 244.*—This gave an average increase of 9·5 per cent. over locals, i.e. about 213 lbs. paddy meaning about Rs. 5-10-0 per acre.

The above strains tried by the District Overseer, Kumta, in different parts of his area continued to give 12 to 20 per cent, increased yields over the locals, this meaning an average extra gain of Rs. 4 per acre. Late Halga strains 1,690 and 1,681 tried in the upghat areas gave 18 and 14 per cent. more yield.

(*h*) *Seed multiplication.*—The following statement shows the seeds of improved paddies multiplied and given over for distribution in the districts :—

Mugad Farm.			*Kumta Farm.*		
	No.	Lbs.		No.	Lbs.
Antersal Early ..	67	645	Muskaty ..	1,315	3,500
„ Midlate ..	90	745	Jeddu ..	1,061	2,000
„ Late ..	200	1,110	Red Halga ..	244	7,000
Mugad Early ..	161	915	White Halga ..	1,690 1,681	300
„ Midlate ..	81	1,136			
„ „ ..	249	868			
„ Late ..	141	810			

III. SUGARCANE.

Work on sugarcane was done on the Arbhavi and Kumta Farms.

(*a*) *Varietal trials.*—On the Arbhavi Farm J 213 which has been for many years the main item of propaganda for the western belt of this division was compared for the first time on a regular experimental basis in the students' method. All the Co. varieties, viz., Nos. 413, 141, 419 and 421 have given very much higher and significant increases over J 213. Co. Nos. 419 and 413 gave over 11,000 lbs. of gul as against 5,269 lbs. of gul on slightly alkaline lands and 8,023 lbs. gul on the *Masari* or Sandier types of soils of J 213. These trials will be repeated for further confirmation.

(*b*) On the Kumta Farm Red Mauritius which has been recommended for many years was compared with Co. Nos. 402, 413, 421, 400 HM. Nos. 87, 544, 320, the results show that whereas Red Mauritius gave 9,896 lbs. of gul (liquid), Co. 413 stood the highest with 14,584 lbs., Co. 402 next with 11,696 lbs., Co. 421 third with 10.344 and HM. 320 fourth with 10,264. Only the yields of Co. 413 is significantly higher than Red Mauritius. Other yielded less.

Another promising variety Co. 419 was brought this year and tried on 2 rows. The results are extremely hopeful. This will, therefore, be tried on a larger scale next year.

(*c*) *Manurial Trials.*—10 carts of F.Y.M. per acre gave better yields than 20 or 30 carts per acre on the Arbhavi Farm. Kumta Farm results showed that about 200 lbs. of nitrogen is the best dose for sugarcane.

Better rotting of *sann hemp green manure*: Four treatments were tried on the Arbhavi Farm, viz. (*a*) only green manure, (*b*) green manure plus 30 carts of F.Y.M. at plowing for better rotting, (*c*) 30 carts F.Y.M only and (*d*) no manure at all. The results show that treatment (*b*) gave the highest yield of sugarcane whereas the other treatments followed in the order (*a*), (*c*) and (*d*). If it is but natural that 30 carts plus green manure must beat the others. There appears to have been a misunderstanding about the quantity of F.Y.M. to be added to the green manure. This has been, in 1939-40, reduced to only 5 carts just as a sprinkling to see the effect on better rotting.

In district trials in Kanara H M. 544 gave 20 per cent. more yield than the red mauritius and the local *Das Kabbhu.*

IV. TOBACCO.

(*a*) *The new tobacco Breeding station at Nipani.*—This station was started this year on a rented piece of land close to the town of Nipani with the object of (*a*) selection and breeding high yielding and superior quality strains from the local varieties of tobacco, (*b*) multiplication of pure seed of improved strains for distribution and (*c*) improvement of yield and quality by better cultural, rotational or manurial methods and (*d*) trial selection and curing of cigarette tobacco.

The area selected was given up at the year end as the Overseer refused to continue the lease and the work has now been shifted to another site. Proposals are now under way to acquire permanently a good area of about 25 acres close to Nipani.

Samples of 'local' types were collected from 17 different villages of the important centres and they were grown for preliminary selection work on the basis of important economic characters. Out of a hopeful lot of 392 selfed plants, 36 have been finally selected for further trial in 1939-40. During May and June 1939, 27 more 'local' samples have been collected for trial and selection.

Due to late starting of the station and want of barn etc., in time no work on cigarette tobacco could be undertaken. But 5 cultivators were taken by the tobacco Breeder to Nadiad and Guntur for training in cigarette tobacco growing and flue curing.

(*b*) Five varieties, viz. Nipani, Nadiad 6, Adcock, Harrison's special and Anekivi were compared with one another on the Dharwar Farm. Nadiad 6 is superior to all the rest, Harrison's special superior to the remaining three which amongst themselves are about equal.

(*c*) *Kumta Farm.*—Cultivation of tobacco was tried on single plots as a *rabi* crop on this farm. Varieties from Kasarkod (South Kanara District), Nipani, Harrison's special and Adcock were grown. The crop was planted in the first week of January. Niciphos seemed to help a good deal to overcome mosaic trouble. Rizoctonia, however, took a good toll. All varieties grew well except Harrison's special, Adock doing the best.

V. GROUNDNUT.

(*a*) *Variety trials.*—The cotton Breeder, Dharwar, compared his old selection spanish peanut No. 5 with his newer selection spanish peanut improved in the students' method. The results show that the latter gave 3,125 lbs. of dry pods per acre as against 2,913 lbs. of the former, the increase of 7·6 per cent. being significent. Pondichery No. 8 an older selection has been maintained pure for distribution in the Mundagi petha.

(*b*) 3 types, spanish peanut No. 5 (an old selection), spanish peanut Improved (a recant find) and valentia were compared with one another on the Dharwar Farm. S.P. No. 5 is superior to both the others but S.P. improved is superior to valentia.

(*c*) 4 strains, viz. A H 447, 334, 186, and 113 sent by the oil seed specialist, Coimbattore, were compared with Pondichery on the Dharwar Farm. AH 334 is superior to AH 186 and 477; local and AH 113 are superior to AH 477 and AH 186 is superior to AH 477.

(*d*) Four seed rates were tried for groundnut spanish peanut. The results show that 100 lbs. and 120 lbs. seed rates make no difference but are superior to 60 and 80 lbs. seed rate.

(*e*) In district trials in Bailhongal and Savadatti Talukas in 6 villages pondichery No. 8 gave about 16 per cent. more yield than local. At Savadatti spanish peanut No. 5 strain gave over 200 per cent. more yield.

VI. JOWAR.

Improved strains of Jowar, viz., Fulgar white, Fulgar yellow, Nandyal, Bilchigan, etc., were selfed and maintained pure by the Cotton Breeder. Trials done in cultivator's field in Savadatti Taluka showed that Fulgar white strain gave 50 per cent. more whereas Bilchigan strain gave 15 per cent. more grain than local Bilchigan.

VII. GRAM.

The selected strain No. 18-12 was compared with the local in the students' method. The incidence of wilt in the local was 99·5 per cent. and hence this practically completely failed. Strain 18-12 showed a wilt incidence of 5 per cent. and yielded, in a season of moisture deficiency, 292 lbs. per acre.

(*b*) Wilt resistant strain No. 18-12 and Burma were compared with the local on the Dharwar Farm. 18-12 is superior to both the others whereas local is superior to Burma.

VIII. TUR.

Wilt resistant in Tur (Cajanus indicus) :—This work was continued on the Arbhavi Farm. Out of 13 resistant strains, two appear to be promising. These will be all further tested. The work has been reviewed and a revised plan laid out.

IX. WHEAT.

Four selected strains, viz., Bansipalli 808, strain 103, Pusa 111 and 114 were compared on the Dharwar Farm with local hard red wheat. Strains 103 and 808 are about equal and superior to all the others. Local is superior to Pusa 111 and 114 between which the former is superior to the latter.

X. Maize improvement.—About 30 good promising strains are now on hand. Half dozen good types have been double crossed for seed distribution on the Arbhavi Farm.

OTHER EXPERIMENTS.

(*a*) *Tapioca.*—Four Gunthas of land was put under this crop at the Kumta farm for a trial as a supplementary food. Two varieties—white and red—were planted at the end of June. These grew very well and were harvested in the third week of November. The weight of tubers per plants averaged about 2 lbs., maximum being 4·5 lbs. It appears, therefore, that this crop would be quite suitable for *Bena* or sloping semi-soft lands now growing poor grass. The crop would be tried again on a larger scale.

(*b*) *Castor.*—Gujarat and Haveri varieties were compared with the local on the Dharwar Farm. Gujarat is superior to the rest two which amongst themselves show no difference.

(*c*) *Varietal trial of chillies.*—Three varieties—Deccan 9 from the Horticulturist to Government, B. P. Poona, Dabkai and local were compared on the Dharwar Farm. The first two are about equal in yield whereas the local stood third.

(*d*) *Farm Yard Manure series.*—The Dharwar Farm has been conducting, since 1908, an experiment on the quantities of farm yard manure for jowar and cotton. It has been decided to close this experiment now and to write up the results of the last 31 years. The results of this year show that with jowar high doses like 5 tons, 10 tons and 15 tons give very high yields varying from 2,100 lbs. to 2,960 lbs. of grain and 6,100 lbs. to 7,515 lbs. of fodder, but such doses are impracticable. 2·5 tons every year gives the highest net cash return even better than 5 and 15 tons. As regards cotton, 15 tons in the preceding year tops the list but 2·5 tons every year is next and close to it in net cash returns.

(*e*) *Better rotting of Sann green manure.*—The object is to see if association of some sprinkling of farm yard manure would rot the green manure better and increase the production. The amount of farm yard manure given for this purpose was as much as the only farm yard manure plot. The results however show that Sann plus farm yard manure gives the highest yield (1,725 lbs. grain), only green manure next (1,512 lbs.), no manure third (1,445 lbs.) and 2·5 tons farm yard manure last. The amount of farm yard manure to be added to green manure has in 1939, been reduced to one cart.

(*f*) *Rotational series.*—Two year rotation :—This is an experiment started in 1929. This is the last year of its fifth cycle. The results show that the jowar-groundnut and gram rotation gives the best net returns, the jowar-tobacco rotation stand next and the jowar-cotton rotation last. Last year, the first two had exchanged places.

(*g*) *Manure* Vs. *No manure to jowar and cotton.*—This is also an old experiment started in 1908. It is dropped. Now the results will be written up. This year's results confirm the past conclusions that manuring with 2·5 tons farm yard manure per acre for jowar, i.e., every second year in a jowar-cotton rotation gives higher yields of both crops as against no manuring. The manured plots have given 1,343 lbs. jowar grain and 592 lbs. of cotton as against 605 lbs. of jowar and 370 lbs. of cotton of the no-manure series. The net cash returns also are positive with manuring and negative with no manuring.

(*h*) *Cotton and groundnut in alternate rows.*—Cotton and groundnut grown in alternate rows give the highest yield and net returns. Groundnut in the *kharif* and gram in the *rabi* stood next whereas cotton alone stood last. The rotation crop was jowar in all cases. The results are based on the total of all the rotation crops.

(*i*) *Mohol Jowar strain M 31.*—Tried in South Belgaum gave an increased yield of 5·7 per cent. *Wheat strain 808* tried in 5 villages in South Belgaum gave on an average 10·5 per cent. more grain ranging from 2 to 20 per cent. *Wilt resistant gram strain* No. 18–12 gave in 5 trials an average of 54 per cent. more yielded.

(*j*) *Pine apples.—Fertiliser experiments* on this crop at the Kumta Farm in randomised plots in 4 replicates showed, in the first produce of this crop, that 35 lbs. of N as F. Y. M. plus 40 lbs. N and 60 lbs. potassium sulphate gave the highest per acre yield, viz., 27,082 lbs. of fruits. Next in order came 35 lbs. N as F. Y. M. plus 40 lbs. N as *Undi* cake, 150 lbs. of potassium sulphate and 60 lbs. P_2O_5 as bonemeal and Undi-cake giving 26,262 lbs. and then came third 35 lbs. N as F. Y. M. plus 40 lbs. N as sulphate of Ammonia, 150 lbs. of Potassium sulphate and 60 lbs. P_2O_5 as bonemeal with 24,651 lbs. 75 lbs. N only as F. Y. M. came last with 21,193 lbs. per acre.

(*k*) *Varietal trials* were conducted on the above farm with (*a*) Mauritius, (*b*) Pernambuca, (*c*) Ruby, (*d*) Wild Kailu, (*e*) Natal, (*f*) Bermuda, (*g*) Kumta local, (*h*) Kumta farm selection while the kew variety served as a check. Fuller details are not yet available.

(*l*) *Cocoanuts.*—The old experiment on dry cultivation of cocoanuts is proposed to be given up on the Kumta Farm.

(*m*) *Cashew nuts.*—For a systematic study of cashew nuts as a paying crop for *Bena* lands, one acre has been planted on the Kumta Farm at 30 feet distance. This start was made in June 1938. The plants are growing very well. No irrigation was given in the hot weather of 1939 but soil around the plants was frequently stirred. Another acre will be put under this crop.

(*n*) *Tung Oil.*—(Aleoritis fordii) :—As yet another probably suitable crop for Bena lands was brought from Assam. Plants were raised in a nursery and when 6″–12″ high were set out in *Bena* land in June 1938. 80 plants have been put in each at 30 feet distance. These have made satisfactory growth. Of these 80 plants, after the rainy season, 40 were regularly watered every 4 days, 20 were given a shade but no watering, 10 were given water through a pot buried nearby and 10 kept without any irrigation or shade. The first lot has given the best growth, the shaded plants stand next, pot watered come a close third, while those without any help stand last. Further progress will be closely watched.

(*o*) *Dhaincha* (Sebania aculeata) *as a green manure crop.*—On the varkas land at the Kumta farm this crop was tried to gauge its growth and yield. It was found that in a fairly decent soil, it grew well to about 30″ height in two months and gave about 17,500 lbs. of green material. Grown for seed it was found that in about 4 to 4·5 months this crop gave about 350–400 lbs. of seed per acre.

D. PROPAGANDA.

(*a*) *Cotton.*—The revised seed multiplication scheme subsidised by the Indian Central Cotton Committee and Government ran its third year in 1938–39. From 1939–40 it will be run under the Rural Development Department and so all the staff has been transferred to that department. The work continued as before, viz., in 7 centres for Jayawant Cotton and 2 centres for Gadag I cotton. For the production of pure seed a reserved area of 66,163 acres for Jayawant in 7 centres in the Dharwar and Bijapur districts and 23,156 acres in Gadag and Ron centres in the Dharwar district was organised. This reserved area contained crops of four generations, viz., from the second to the fifth. 62,185 acres of Jayawant area and 23,482 acres of Gadag I area (including some more of known crops of farmers) were rogued for purifying at an average cost of 4·4 pies and 4·35 pies per acre respectively. This organisation was this year also worked through co-operative cotton sale societies of Hubli, Dharwar and Gadag as also a number agents all of whom who gave very commendable co-operation.

In all 45,44,198 lbs. of Jayawant and 16,18,205 lbs. of Gadag I seed was stocked. 31,38,154 lbs. of Jayawant seed enough for 3,24,197 acres and 11,29,540 lbs. of Gadag I seed enough for 1,12,944 acres were distributed. This shows an *increase* of 75,380 lbs. of seed stocked and 3,83,056 lbs. of seed given out and 78,879 acres covered under Jayawant and 3,88,334 lbs. seed stocked, 2,03,726 lbs. given out and 20,405 acres covered under Gadag I as compared to last year. The exact intended progress however in each centre could not be made because owing to very favourable *kharif* rains more early sown other *kharif* crops were sown particularly in the Athni, Bagalkot, Bijapur and Bailhongal centres where much cotton seed remained unsown. But the progress on the whole was not unsatisfactory.

Reserved area *Kapas* was collected, pooled, graded and sold by auction through sale societies and agents. Auction sales were highly appreciated by cultivators. 49 auction sales were held in all. The Jayawant *dokras* received were 59,012, graded were 38,854, sold by auction were 35,681 and by private arrangements 22,979. The Hubli society sold only 4,734 *dokras* by auction and 12,769 *dokras* by private treatise whereas in the other centres in the Dharwar district auction sales were more prominent. In the Belgaum district the Athni and Bailhongal centres sold all its cotton by auction, the regulated cotton market having sold 7,500 *dokras* by daily auction. In the case of Gadag I cotton, 18 auction sales were held, 36,898 *dokras* received, 34,637 *dokras* graded, 34,637 sold by auction and only 2,261 *dokras* were sold by private treatise. Jayawant received a premium from Rs. 6 to Rs. 15 per Naga over local Kumta and Gadag I Rs. 25 to 29 per Naga over local Dharwar American in the ordinary Bazar. Selling by auction gave the farmers a further extra (over market rates) of Rs. 3 to Rs. 10 in different centres for Jayawant and Rs. 9 for Gadag I. The total pedigree seed of the second to the sixth generation graded *kapas* stocked for distribution in 1939–40 is 44,77,986 lbs. of Jayawant and 10,66,865 lbs. of Gadag I.

Cotton Transport Act.—The 26 check stations—20 temporary and 6 permanent—were run during the year as before. These were inspected by the District Overseers and the Cotton Superintendent. There appears definitely a great need for an independant supervising arrangement for these check stations if they are to work effectively. Licenses were issued for importing good cottons from the surrounding prohibited areas. The three licensing officers issued in all 2990 licenses for road transport and 420 for rail transport. In all 3577 *dokras* of seed cotton and 27,704 *dokras* of lint were brought in by road and 69 *dokras kapas* and 3787 *dokras* of lint imported by rail.

Regulated cotton markets.—The Regulated markets at Bailhongal in the Belgaum district and Bijapur continued to work. The work of applying this act to Nargund, Gadag and Hubli is going on. The cotton Superintendent was the Chairman of the Market Committee at Bailhongal and the D. A. O., Bijapur at Bijapur. The Bailhongal market received up to 30th June 1939 in all 63,613 *kapas dokras* and 1605 lint *dokras* and all except 55 *kapas dokras*, were sold by auction. This market received in all Rs. 9,904 including Rs. 2,062 as market cess and expended in all Rs. 6,200. The Bijapur market received 55,908 *kapas dokras* and 20,667 lint *dokras*, sold all except 1078 and 2835 respectively, getting a total income of Rs. 7,432 including Rs. 3,636 as market cess and spending Rs. 3,567. This ought to be considered very satisfactory.

Taluka Development Association.—All these Associations continued their useful activities as before. They will hence forth be absorbed into the new rural development organisations and it is expected that with better financial aid they would do more intensive work on a restricted area.

The Wilson Antifamine Institute, Bijapur.—These Institute has been of very great assistance indeed and did very good work. The District Agricultural Overseer worked as a Secretary. Much of the seed and implement distribution and other work in the Bijapur District was done through this Institute.

Tractor plowing.—For the eradiction of *Hariali* grass from fields, tractor plowing has been going on for several years. This year the Hubli Tractor plowing company plowed 608 acres of land of which only 49 acres were on Tagai Basis. The tackle used was a T D 40 tractor and Rud sack C V 14 N plow and the work was done for only 3 months after which the tackle had a serious break down.

Nurseries and supply of plants.—In this division the farms at Dharwar, Kumta and Arbhavi run small nurseries for supply of fruit plants etc. to farmers.

The Arbhavi farm has sold 6637 grafts, seedlings and plants of various kinds, the Dharwar farm 76 mango grafts and the Kumta farm 600 mango grafts, 8,000 pine apple suckers and 1,100 other plants.

Mango orchard.—Out of 85 trees on the Dharwar Farm, 60 fruited this year giving in all about 14,000 fruits which fetched Rs. 213 showing on average of 233 fruits and Rs. 3·5 per tree.

Poultry Farm.—The total birds on the Dharwar farm ranged from 125–175 with an average of about 140. 14 hens have been selected for eggs for hatching. These gave 1997 eggs showing an average of 170 eggs for white leghorn and 111 for Red Island Rhodes per hen per year. 1310 eggs were sold for hatching. 119 birds died in the year due to mostly cold and croup. 69 birds were sold. The total expenditure came to Rs. 316 for contingencies giving Rs. 195 as the receipts.

Crop protection.—The work of protecting crops from the ravages of the wild pigs was continued. 10 Gun clubs and one crop protection society particularly did good work, killing in all 496 pigs. Six more gun club groups were organised during the year. The total kill of all clubs was 567 and a large number of pigs were scared away. It is estimated that crop on about 90,000 acres was thus protected. The farming public has appreciated these results and more applications for formation of other gun clubs are being received. The deer campaign at Kanjgeri also went on well.

At the end of the year these were the following group gun clubs working: Dharwar district 6, Belgaum district 8, Karwar district 9, Bijapur district 1. Gun clubs being formed were 5 in the Dharwar district, 7 in the Karwar district and 4 in the Belgaum district. The enclosed map showing the net work of these clubs gives a good picture of the clubs.

Taluka Demonstration centres.—This was a new activity undertaken this year. The idea of these centres was to take in hand a good former with a fairly decent holding and help him to put in his estate all possible improvements as regards land improvements, better tillage, improved crops, disease control etc. to show him and the farming public around the benefits of improved farming. The following is a very brief summary of work done on these centres.

1. *Bagalkot.*—Owner Mr. S. Kupsad. Items taken: Bunding as per modern method at a cost of Rs. 600. Crops taken: Jayawant cotton, wheat strain 808, Jowar Maldandi No. 35-1, ground spanish peanut No. 5, soya beans. All these improvements were much appreciated by surrounding farmers. Owner left as an under trial prisoner.

2. *Bargi* (*Kumta taluka*).—Owner Mr. V. R. Pandit, total area 16 acres. Items taken up: Improved paddy strains No. 244 and 1315 gave 12 and 15 per cent. higher yield. Onion, Cabbage etc. chillies, and other local vegetables on 8 acres in the *rabi* season under irrigation and udid, sayabeans, groundnuts a dry rabi crops. All these crops grew quite well and were much appreciated by surrounding cultivators.

3. *Karmalli* (*Siddapur taluka*).—Owner Mr. G. A. Hegde, total area 28 acres including a four acres betlenut garden. Other crops taken: Halga paddy No. 1690 gave on 34 per cent. increase over local Jeddu. Various vegetables in the rabi season like Cabbage, radish, tomatoes, brinjals, chillies etc. were grown under irrigation and a few pulses as dry crops. About 1000 people visited this centre.

4. *Bijapur.*—Due to late start of these centres all ideas could not be put in, Jayawant cotton, wheat No. 808.

5. *Bagewadi.*—Jowar No. 1735-1, 12" vs. 18" sowing of Jowar were demonstrated. About 100 farmers saw this centre.

6. *Hirekodi (Taluka Chikodi).*—Items taken up : Sulphuring Jowar seed, wider spacing and inter tillage for jowar and cotton. *Jarda* making in tobacco. Appears more hopeful.

7. *Belgaum.*—Owner Mr. G. T. Patil. Area 10 acres. Improved crops of sugarcane and paddy were grown and shown to surrounding farmers.

8. *Bailhongal.*—The crop grown on this centre were decidedly better than the surrounding crops and neighbouring farmers are much interested.

9. *Haveri.*—Owner Mr. G. G. Magavi, Area 55 acres, 20 gunthas. The crops grown were improved groundnuts, Gadag I cotton, udid and chillies. The total expenditure was Rs. 870 and receipts Rs. 1,661. The Rural Development Inspector doubts these figures given by the owner.

Bunding schemes.—The Embankment Officer, Dharwar, was mostly busy with bunding classes. The Bunding Officer, Bijapur, who started from the middle of June 1938 was partly engaged in working for a short time in the Bunding class at Bagalkot and for 3 months with the central Bunding class at Poona. During the remaining period he prepared, for the public, 25 bunding schemes covering about 738 acres at a total estimated cost of Rs. 12,414.

A very large number of applications for bunding schemes, some over as old as 5 or 6 years, are still pending. People have now started asking for refund of their deposits. It was clear that unless the bunding classes are worked by a separate staff, the important and increasingly appreciated work of bunding schemes will linger behind thus causing considerable disappointment and draw-away people from the results of a number of years hard intensive land development propaganda. All this work both classes and bunding schemes has now been transferred to the Rural Development Department, from 1st August 1939.

The Dharwar District Agricultural Association.

The only sign of the life of this association was its Kannad monthly magazine Okkaligaroo Okkalatanavoo. About 1,000 copies are printed. The number of copies subscribed by the public, including libraries etc. is 91. Government buys 364 copies. 91 go free to members. Government gives a subsidy of Rs. 884-7-0. The Superintendent of the Dharwar Farm is the ex-officio editor.

General Propaganda results.—This year's propaganda results are shown in the accompanying statement.

GENERAL DISTRICT

The district staff continued to carry out their propaganda work as usual.

Items.	Belgaum District.			Bijapur District.	
	District Agricultural Overseers			District Agricultural Overseers	
	Belgaum.	Bailhongal.	Chikodi.	Bijapur.	Bagalkot.
(1) *Seeds*—					
Jowari (improved types) Lbs. ..	1,500	1,310	316	22,500	6,000
Paddy (,, ,,) ,, ..	46,736	10,225	..	....	..
Wheat No. 808 ,, ..	6,000	3,120	4,200	33,300	4,600
Cotton (Improved types) ,, ..	16,470	300	15,880	1,26,000	400
Tobacco (Gandio No. 6) ,, ..	6	1/2	1	....	..
Gram (Wilt resistant) ,, ..	..	500	1,375	....	..
Groundnuts (Improved) ,, ..	..	5,800	200	....	..
Sugarcane sets (Nos.)	55,000	..	13,500	....	..
Others	176	..	100	....	40
(2) Fruit and other plants	8,280	1,537	3,490	2,978	425
Grafts, seedlings, etc., etc., including pinecapple.					
(3) Manures, etc.—					
Chemical Lbs.	72,056	67,600	34,720	1,000	5,600
Oil cakes ,, ...	60,000	..	..	5,90,400	..
Bone meal ,, ...	..	..	..	1,000 lbs.	..
Salt ,, ...	..	..	..	....	..
Improved pits done green manure spread—acres	3,000	100 (proposed).	35	....	..
(4) Implements (Various)	25	4	88	60	..
(5) Breeding bulls supplied and supervised	4	15	9	....	7
(6) T. D. Association helped ..	1	2	2	....	..

PROPAGANDA WORK.

The following statement would give an idea of the work done.

Dharwar District.			Kanara District.		Total.
District Agricultural Overseers			District Agricultural Overseer		
Dharwar.	Haveri.	Gadag.	Kumta.	Karwar.	
....	....	....	....	....	31,626
73,400	1,20,000	....	12,360	20,500	2,73,221
....	....	18,300	....	....	39,520
....	....	....	....	....	1,59,050
....	....	....	....	....	7½
....	....	250	....	....	2,075
....	....	5,000	....	....	11,000
3,65,300	....	....	1,50,000	23,500	6,07,300
....	....	....	....	....	316
511	900	623	10,800	3,300	32,844
84	....	....	22,400	42,000	2,45,420
....	....	....	....	....	6,50,400
....	....	....	....	4,000	5,000
....	....	....	20,000	48,000	68,000
439	92	....	....	....	666
....	....	13	....	....	190
3	99	3	....	....	140
1	....	3	....	....	9

Items.	Belgaum District.			Bijapur District.	
	District Agricultural Overseers			District Agricultural Overseers	
	Belgaum.	Bailhongal.	Chikodi.	Bijapur.	Bagalkot.
(7) Demonstration held—					
Cattle	..	..	2	.. ..	..
Crops	10	28	20	40	7
Implements	11	11	8		5
Talks	..	1	22	.. ..	..
(8) Insecticides and fungicides : sulphur, lbs.	..	80	2,300	184	..
Insecticides and fungicides : sulphur, in packets	80	75	..	.. ..	32
Others (acres)	..	..	75	.. ..	..
(9) Classes—					
Bunding (helped)	1	2	1	.. ..	1
Horticultural (helped)	1	..	..	1	..
Sugar-making (,,)	1	..	..	.. ..	..
Jail classes taught	Monthly.	..	..	.. ..	..
(10) Gun Clubs, etc., supervised ..	5	..	..	.. ..	..
(11) Cotton check-stations checked ..	..	..	5	.. ..	..
(12) Bunding scheme helped	..	1	..	1,00,000 Rs. Tagai given.	..
(13) Poona furnaces constructed ..	..	..	14	.. ..	..
(14) Agricultural Bias Class checked ..	All.	5	2	.. ..	..
(15) Koleroga spraying done (acres) ..	..	..	..	.. ..	..
(16) Cattle Breeding Societies guided ..	..	..	..	.. ..	9
(17) Shows (Mango)	..	..	..	.. ..	..

Dharwar District.			Kanara District.		Total.
District Agricultural Overseers			District Agricultural Overseer		
Dharwar.	Haveri.	Gadag.	Kumta.	Karwar.	
....	3	....	....	....	5
43	24	3	38	58	307
3	....	2			
3	....	1	....	....	27
4,480	....	581	....	....	7,525
1,260	....	....	....	....	1,447
....	....	....	....	....	75
1	....	3	....	....	9
....	....	....	....	....	2
....	....	....	....	....	1
....	....	....	....	....	....
....	....	1	....	4	10
....	3	6	....	....	14
....	....	....	....	....	....
....	....	....	....	....	14
1	....	....	....	....	All.
....	....	....	2,663	286	2,949
....	8	....	....	....	17
1	....	....	....	....	1

E. Agricultural Education.

The Kannad Agricultural School, Devihosur.

This school continued its activities quite satisfactorily. The total number of students in the year was 28, the first year classes have 15 and the second year 13. The Dharwar district contributed 13, the Bijapur district 10, Belgaum 4 and Kanara only one. The average per head boarding expenses came to Rs. 7-11-8. The total number of boys sent out with certificates now comes to 287. 37 primary school teachers have so far been trained in agricultural bias from this school, Belgaum claiming the largest credit with 15, Bijapur next with 11, Dharwar standing third with 8 and Kanara last with only 3. The past students' association formed in 1935 has now become practically moribund, the annual general meeting in January 1939 having been adjourned for want of quorum. The farm returned satisfactory yields.

The total expenditure of the whole school came to Rs. 7,827 and the receipts amounted to Rs. 1,044. The cost per boy comes to Rs. 238 per year.

The annual social gathering was presided over Mr. Narsing Rao Desai, Kollapur, M.L.C.

Bunding Training classes.—This was a new sphere of educational activity this year.

The Embankment Officer, Dharwar, conducted in all eleven classes at Torvi and Bagalkot in the Bijapur district, Marewad Sasvihalli, Devihosur, Mundargi, Nargund, Yakkundi in the Dharwar district and Chachdi, Kollolli and Athni in the Belgaum district. The total number of students trained came to 589, the majority of them being Lingayats 389, Brahmins being the next in number 117, Raddies being the third 53. In all 19 castes were included. As regards ages students between 20 and 30 years were 369, those between 31-40 years were 78, those above 40 being 42 the rest being below 20 years of age. As regards lands owned by the students, it is noted, that those with areas upto 10 acres were 71, 11 to 20 acres were 134, 21–50 acres were 218, 51–100 acres were 128, and above 100 acres were 120, the rest being landless. The number of villages from which the students were drawn was 233. Of the total 589 students, 114 paid for their food whereas the remaining were fed at Government expense.

The average period of classes varied from 10-15 days. The general type of students was not so much a self-working farmer though these were some of this kind. Perhaps next year this could be much improved upon because as yet the average farmer is not much attracted to such classes, he still being shy of such ventures. Many small farmers cannot leave their homes. Big farmers are yet not interested. Though as a class, majority were from intermediate or back-ward classes, the

tendency towards note taking was more evident than towards field work. It is yet to be found out by a "follow up" scheme how many of these trained men do improvements on their or neighbours' farms and how many scatter away elsewhere and forget this training.

The total amount spent on contingencies for all these eleven classes including lodging, boarding, small trips and temporary staff was Rs. 6,300-13-3 meaning an average of Rs. 573 per class. The largest item was boarding (Rs. 2,328), the smallest being lodging. (Rs. 38).

K. S. KULKARNY,

Dharwar, 31st August 1939. Deputy Director of Agriculture, Southern Division.

Programme of work under the Deputy Director of Agriculture, Southern Division, (for the New Southern Division,) Dharwar, 1939-40.

(A) Research and Experiments.

(i) *Cotton Breeding.*—Further selection work in Kumta and Dharwar American, for wilt immunity, higher, yield, earliness, and good staple. Further testing of Jayawant, New Jayawant, early Jayawant strains, Gadag No. IX Co, crosses. This work will be done on lines recently decided in a meeting of the Deputy Director of Agriculture, Plant Pathologist and the Cotton Breeder, S. M-C., Dharwar and approved by the Director of Agriculture.

(ii) *Jowar.*—The improved strains of the five important jowars will be multiplied and pure seed obtained for distribution.

(iii) *Groundnut.*—The strains spanish peanut No. 5 and improved will be maintained pure and multiplied.

(iv) *Gram.*—The wilt resistant strain 18–12 will be kept pure and multiplied. New varieties of gram to be got from Delhi will be tried for their performance in Karnatak.

(v) General Experiments.

(a) *Dharwar Farm.*—Varietal trials of wheat, groundnut, mug, tobacco sann green manure experiments, rotational, tillage, spacing and mannurial experiments on Jowar and Cotton, seed-rate and spacing experiments on groundnuts as approved by the Director of Agriculture will be worked out.

(b) *Arbhavi Farm.*—Varieties of sugarcanes, chillies, cotton Gadag I X Co. will be compared. Work on *tur* wilt and maize breeding on revised lines will be done.

Fruit nursery will be continued.

(c) *Mugad Farm.*—Further selection work in local and non-Bombay rices will be carried out: Seed of selected strains will be multiplied on the farm as also through an informal Rice Growers' Association.

(d) *Kumta Farm.*—Further testing of selected strains of paddy varietal trials of cane, pine apples and multiplication of selected paddies will be done. Economics of cashew nut plantation, Tung oil trees will be worked. Nursery will be extended to suit demands.

(e) *Kopargaon Farm.*—Experiments on cane varieties, mannurial doses water requirements, rotational series, varieties suitable for different adsali plantings will be carried out.

(f) *Ratnagiri Farm.*—Selected paddy strains will be kept pure and seed multiplied. Trials to effect change in harvest season of pine apples, early bearing and annual bearing of mangoes, study of the yields of Santra, Musambis, grapes, guavas, limes, etc., will be continued.

(g) *Mohol Farm.*—Selected Maldandi and Dagdi jowar strains will be kept pure and seed multiplied.

Other experiments.—Trial of cultivation of cocoa Tung oil and dry napier grass will be conducted on different parts.

The district trial of cottons will be conducted through the cotton Superintendent, S.M.C., Dharwar. All other district trials have been dropped for want of staff.

(b) *Education.*—The Kannada Agricultural School, Devihosur will be conducted as so far. This will in 1940 pass over to the Educational Department.

K. S. KULKARNY,

31st August 1939. Deputy Director of Agriculture,
Southern Division, Dharwar.

APPENDIX F.

Summary of Work done under the Deputy Director of Agriculture, Northern Division, Surat, for the year 1938-39.

Gujarat.

I.—STAFF.

I held the charge of the post of the Deputy Director of Agriculture, Gujarat, Surat, till 15th September 1939. According to the reorganisation plan, propaganda staff consisting of 12 Agricultural Overseers, 6 Agricultural Sub-overseers and 2 clerks from this division were transferred from 15th April 1939 to the Rural Development Department in charge of the Registrar of Co-operative Societies and Director of Rural Development. On abolition of one post of Deputy Director of Agriculture, North Central Division, Nasik, the research staff of that division was amalgamated into Gujarat; the whole division now being in charge of the Deputy Director of Agriculture, Northern Division, with headquarters at Surat.

Mr. M. L. Patel, M.Ag., Cotton Breeder, South Gujarat, Surat, was transferred as Crop Botanist to the Government of Bombay, Karjat on 3rd August 1938 and Rao Saheb S. H. Prayag, M.Ag., Cotton Breeder, Jalgaon, took charge of the office of the Cotton Breeder, South Gujarat, Surat, on 8th September 1938. The charge during the intervening period being held by me.

Rao Saheb S. H. Prayag proceeded on leave on average pay for four months from 24th April 1939 and Mr. A. K. Shah, B.Ag., was appointed to officiate in his place.

Rao Saheb G. P. Pathak, Cotton Superintendent, Surat, proceeded on leave on average pay for four months from 17th January 1939 to 16th May 1939; Mr. J. G. Naik, B.Ag., Superintendent, Surat Farm, worked as officiating Cotton Superintendent, Surat, from 17th January 1939 to 13th April 1939 and Mr. T. V. Nagarsheth, L.Ag., officiated in that post from 14th April 1939 to 16th May 1939.

The post of the Cotton Superintendent, Surat, together with his office establishment has been transferred to Rural Development Department from 14th April 1939.

II.—SEASON.

The monsoon broke out from the beginning of June, unusually earlier by one to two weeks and the sowing of all kharif crops was over by the end of the month. Railfall in June as well as in July was more than normal. The month of August except the last week passed off practically

without any rain especially in North Gujarat. In September, there were light showers in Surat district; in the remaining districts of Gujarat, however, there was practically no rain, affecting the growing plants of cotton, groundnut, paddy and other cereals. Few showers in the beginning of October were barely sufficient, though opportune for cotton and jowar in the Surat district. The monsoon ended from the second week of October. In the month of October, sowing of rabi crops was done and harvesting of cereals was commenced. Groundnut was harvested in November. The total rainfall for the season may be said to be normal for cotton and jowar and irregular for rice, tobacco, etc.

There were few serious pests worthy of note. The hairy caterpillars appearing by middle of June in Broach and Kaira districts did slight damage to bajri and til. Wheat crop was considerably damaged by the stem-borer attack in the month of December especially in the Broach district where lang crop also suffered by the attack of lang caterpillar. The wilt attack in cotton was very low this season.

Yield of rice was very low in Kaira district and that of wheat and lang in Broach district.

III.—RESEARCH AND EXPERIMENTAL WORK.

(1) Crop Breeding.

Surat.

Cotton—Selections.—One bio-type S-9-1-4 from Selection 9 of 1932-33 that gave high ginning last year proved to be a high ginner (38·9 per cent.) this year also; its staple length is 1·00" and is finer than 1027 A.L.F. It is estimated to spin 40's and is earlier in boll-opening than 1027 A.L.F. by at least two weeks. The four selections mentioned in the last year's report viz., S. 7, S. 8, S. 14 and S. 5 were found this year also superior to 1027 A.L.F. in fibre properties and lower in ginning percentage except in the case of S. 5 which gave the same ginning percentage as 1027 A.L.F.

Crosses.—Selection was continued in all the crosses including those intended for combining wilt resistance and grown on the wilt affected plot at Shera. With a view to get higher wilt resistance, fresh crossing was done on Segrate 8·1 with the pollen of three types viz., K. F., N.S. 12 and B. D. 8 from the Plant Pathologist to Government, Poona, at the Shera plot.

With a view to combine higher ginning percentage and spinning value with better fibre qualities three fresh crosses were made this year at Surat by using the pollen of Broach B. D. 8 backcross Segregate 1-6 on (1) 1027 A.L.F., (2) Seg. 8-1 and (3) Seg. 22-3-2-8.

Comparative trials.—1027 A.L.F., 1 A.L.B., Seg. 8-1 and B.D. 8 were tested for yield in eight randomized replications, the area under each sub-plot being 1·47 gunthas. In yield of seed cotton per acre, 1 A.L.B. and B. D. 8 were significantly superior to 1027 A.L.F. and 1 A.L.B. was also significantly superior to Seg. 8-1. In yield of lint, 1 A.L.B. topped the list followed by Seg. 8-1, while lint yield of 1027 A.L.F. was the same as that of B.D.8.

Spinning tests :—

Name of the type.	Average ginning. per cent.	Average fibre length by Ball's Sorter in inches.	Fibre weight per inch.	Intrinsic strength.	Fibre maturity ratio.	Valuation per candy in Bombay.	Highest standard warp counts.
						Rs.	
1027 A.L.F. ..	37·5	0·93	0·197	0·95	63/20	65 On	34's
1. A.L.B. ..	40·1	0·85	0·218	0·79	67/18	30 On	27's
Seg. 8-1	39·3	0·92	0·212	0·91	56/22	43 On	28's
B. D. 8	34·7	0·90	0·187	1·05	65/17	40 On	35's

All the four types have given lower mean length and higher fibre weight per inch than last year.

All except Segrate 8-1 contain a higher percentage of mature hairs than last year.

Standard 1027 A.L.F. and Seg. 8-1 possess practically the same fibre length and intrinsic strength.

B. D. 8 is somewhat stronger while 1 A.L.B. is somewhat weaker than 1027 A.L.F. and Seg. 8-1.

In valuations standard 1027 A.L.F. shows Rs. 22 more than Seg. 8-1 at Bombay, while it has been valued more by Rs. 5 only than Seg. 8-1, at Surat.

Mill tests.—Lint samples, 100 lbs. each of 1027 A.L.F., 1 A.L.B. and Seg. 8-1 were sent to the Spring Mills through the Director, Technological Laboratory, Bombay. The results show that Seg. 8-1 is better than 1 A.L.B. and slightly inferior to 1027 A.L.F. in spinning value.

Seed production.—The quantity of selfed seed produced of each type is shown below :—

Type.	Quantity of selfed seed produced.	Remarks.
1027 A.L.F.	326 lbs.	20 lbs. supplied to Baroda State.
Seg. 8-1	30½ ,,	
1 A.L.B.	86 ,,	76 lbs. supplied to Sonsak Co-operative Society.
B.D.8.	23½ ,,	

Jowar.—Twenty types were maintained pure by selfing ; 24½ lbs. of selfed seed of Budh Perio 53 was produced for further multiplication.

Interspecific Hybridization in Cotton, Surat.—The work now forms a scheme financed by Indian Central Cotton Committee at a cost of Rs. 14,014 spread over a period of five years commencing from 1st November 1938.

23 hybrids were maintained as ratoons and were further propagated by cuttings and graftings. 8 backcross plants were raised from 51 seeds obtained last year, bringing the total of such plants to 27 ; of these 15 proved to be fertile either by selfing or backcrossing. Nearly 153,000 flowers of the hybrids were backcrossed to their respective American parents giving 43 successful bolls with 55 seeds. A large progency was raised from the seeds of backcrosses and further selection was done. B.C. No. 22 proved fertile with desirable qualities while combining the characters of both the parents. Colchicine and acenaphthene were tried for inducing doubling of chromosomus in hybrids but they proved to be unsuccessful except in case of colchicine treatment to seeds. Fresh crossing work was carried on with sea-Island and 1027 A.L.F. and 33 bolls with 49 seeds were obtained.

Broach.

Cotton.—This is the seventh season of the cotton work financed by the Indian Central Cotton Committee.

Crosses.—Selection was continued in crosses and back-crosses. In all 86 healthy plants with ginning varying from 37·2 per cent to 45·2 per cent. and fibre length varying from 20·7 mm. to 24·3 mm. have been retained for further study.

Comparative trials.—The nine best segregates were tested in nine random replications in the wilt infected soil for wilt resistance and in the

wilt free soil for economic characters including yield. The results show that all the segregates are highly resistant to wilt like the B. D. 8 parent. All except 6–25 have ginning above 40 per cent. and are significantly superior to B.D. 8 and 6–25. In fibre length, five segregates are as good as B.D. 8, while two segregates are shorter than B.D. 8. The differences in yield of seed-cotton are not significant in the case of wilt infected plot. In the wilt free soil, one segregate viz. 5–18 is significantly superior to both the checks, viz. B.D. 8 and Broach Local and to rest of the segregates except 6·20.

Spinning tests.

Variety.	Fibre length by Balls and Baer Sorters Average inch.	Fibre Wt. per inch millionth of an oz.	Highest Std. Warp Counts.	Fibre maturity test			Valuation by	
				Mature Percent.	Half Mature Percent.	Immature Percent.	Tech. Laboratory Matunga basis Rs. 168.	Cotton Company, Broach Rs. 168.
B. D. 8 General ..	0·88	0·203	38	69	19	12	15 On	35 On
76–1	0·88	0·173	39	61	15	24	30 On	20 On
76–8	0·88	0·169	36	54	20	26	30 On	5 On
76–12	0·90	0·180	38	67	15	18	30 On	20 On
1–2	0·87	0·184	36	55	21	24	20 On	12 On
1–6	0·88	0·178	36	56	23	21	25 On	10 On
1–10	0·87	0·162	31	53	21	26	22 On	10 On
5–18 ..	0·84	0·180	35	52	19	29	30 On	20 On
6–20	0·89	0·162	36	54	18	28	32 On	10 On
6–25	0·87	0·205	34	62	19	19	27 On	12 On
N. S. 12 ..	0·77	0·196	22	55	24	21	0 On	3 On
Broach Local B. D. 8.	0·76	0·220	11	51	24	25	4 On	2 On
Maintenance ..	0·89	0·188	39	69	17	14	20 On	not done.

As compared to the spinning test results of the previous year, there has been a considerable increase in fibre weights and a considerable fall

in the highest standard warp counts of all the samples. In maturity tests, only Segregates 76–1, 76–12 and 6–25 approach B.D. 8 standard.

Valuation figures show that all the segregates have been valued Rs. 5 to Rs. 17 more than B.D. 8 at Bombay but Rs. 15 to Rs. 30 less at Broach.

Seed multiplication.—321 lbs. selfed and 594 lbs. open fertilized seed of B.D. 8 was produced for further multiplication.

Viramgam.

Cotton—Selections.—104 plants representing 36 families and 46 newly selected (for earliness, sympodial habit and good bearing) were grown in progeny-row-cultures. Of these, 17 cultures are retained for further trial. They are equal to or higher than local wagad in ginning percentage (though lower than wagad 8). Most of them are superior to both in fibre length. A few of these promise to be better yielders than wagad 8. From the remaining cultures, 31 individual plants are selected with ginning percentage 35 per cent. to 46 per cent. and fibre length 20 mm. to 24 mm. for further study.

Crosses.—Of the 45 hybrid selections from crosses of Wagad types with Surtee-Broach quality cottons (1027 A.L.F, and B.D. 8) in F_4, F_5 or F_8 generations, four cultures are promising (G. P. —37 per cent. to 39 per cent. and fibre length 21 mm. to 21·8 mm.) From the remaining 11 cultures, 16 plants with G. P. 37 per cent. to 43 per cent. and fibre length 20 mm. to 23 mm. are selected for further test. One more type of Surtee cotton viz. Seg. 22—3—1—3 known to be earlier than 1027 A.L.F. by about a fortnight and spinning as high as 40's to 45's (G. P. 32 per cent. and fibre length 22 mm.) has been used for crossing with wagad 8. From the first backcross with wagad 8, 33 plants with ginning 38 per cent. to 45 per cent., fibre length 21 mm. to 23 mm. and better feel have been selected.

Crosses of wagad strains with herbaceums other than Indian.—Most of the F_1 crosses of Wagad 8 with Russian, Persian and Early herbaceums (the latter from Trinidad) were earlier in flowering by 2 to 4 weeks than wagad 8. In ripening, however, only three were earlier by one to two weeks. Amongst the various F_1 crosses, ginning varied from 34 per cent. to 42 per cent. and fibre length from 18 mm. to 23 mm. The crosses with Russians have particularly silky feel.

Comparative yield trials.—The randomized replication test of ten wagad selections with wagad 8 and local as checks showed that three, viz. 85–2, N. 89 and 98–1 were significantly higher in yield than both the checks. N. 89 is better on account of longer fibre than local wagad (21·7 mm. v/s 18·7 mm.) with slightly higher ginning percentage (36·1 v/s 35·5 per cent.).

Seg. 4–1 is under comparative tests with wagad 8 and local since 1933–34. Its average performance is given in the following table :—

Type of cotton.	Yield of seed-cotton per acre. lbs.	Ginning Per cent.	Yield of lint per acre lbs.	Fibre length inches.	Spinning value (1933–34 to 1937–38.)
Wagad 8	559	39·2	219	·80	14 (12 to 17)
Seg. 4–1	514	42·3	217	·79	19 (15 to 24)
Local Wagad	501	35·1	176	·82	17 (12 to 19)

In monetary returns per acre, there is no difference between wagad 8 and Segregate 4–1, though both give about Rs. 5 more per acre than local wagad.

Jowar.—Four types, viz. C. 8–2, C. 10–2, U. 3–4 and U. 11–4 were tested in six randomized replications with local Chhasatio and local Utavali as checks, the area under each plot being 0·7 gunthas. Due to failure of late September rains, the late types 8–2 and 11–4 and local Chhasatio gave much less yield (64 to 91 lbs. per acre) of grain than early types and local Utavali (374 to 418 lbs. per acre). The three early types, however, gave less fodder yield (2406 to 2703 lbs. per acre) than the three late ones (3394 lbs. to 3754 lbs. per acre). Among the three late types, 11–4 is significantly superior to local Chhasatio in fodder yield. Comparing the three early ones, 10–2 gives higher yield of fodder than 3–4 which latter in turn gives higher yield of grain. The differences in grain and fodder yield of 10–2 and 3–4 in comparison with local Utavali are not significant except that local Utavali tends to be superior to 10–2 in grain yield. The fodder quality of 10–2 is, however, much superior to ordinary Utavali.

Of the 56 additional selections made during 1933–34 to 1937–38, 35 are retained ; these together with 50 fresh ones will be grown for further study.

Examination of Cotton Samples.

The Cotton Technological Assistant, Surat, is maintained from the funds of the Indian Central Cotton Committee. During the year 1938–39, 134 samples were received for detailed laboratory tests—24 from Surat, 82 from Broach and 28 from Viramgam. Besides the above, 14 other samples were received for various fibre tests—8 samples of kapas

from different cotton growing Societies from different localities in Baroda State, 5 samples from Wardha Ashram, Nalwadi and one from District Agricultural Overseer, Broach.

Samples tested.—Out of the total number of 148 samples received for testing, 109 were tested for fibre length, 138 for maturity, 84 for fibre weight and 17 for fibre strength.

Nadiad.

Tobacco.—

Selection in Keliu variety.—1 Bidi—In line yield series K–23, K–24 and K–49 showed superiority over local by 57 per cent., 78 per cent. and 63 per cent. respectively. In replication tests only K–24 is found slightly higher in yield than the local. It was observed that K–49 is earlier than K–24 by about 12 days.

2. *Cigarette.*—Eight old and four new varieties were attacked very badly by virus disease and only Harrison Special was studied in details for the economic characters. Indicative study is, however, done and some types are found promising.

Successful raising of Tobacco seedlings.—Seedlings were raised on 16′× 4′ beds under Kantan shade, as well as open in duplicate beds. The number of seedlings available under shade is 2827 as against 1152 obtained in open.

Out of the fungicides tried so far for controlling damping off diseases the chest-nut compound treatment seems to be promising.

Flue Curing.—The cost of flue curing was the same as in 1937–38, i.e. Re. 0-1-8 per lb. of dry leaf. The cigarette tobacco was sold at Re. 0-1-0 to Re. 0-6-0 per lb. and the average for all the qualities of different grades works up to Re. 0-2-1 per lb. or Rs. 65 per candy of 500 lbs. which is near about the same as for the Guntur produce this year.

Seed Multiplication.—8¾ lbs. selfed seed of G–6 and 17¼ lbs. of K–49 were produced this year for multiplication.

Bajri.—On the basis of block yield selection 207–8 has given a 6 per cent. higher yield of grain than standard 207. The other high yielders are 207–26 and 206–18. In straw yield the results of 207–8 are generally positive, though in one case, it has yielded less.

District Trials.—Figures of 23 comparative trials spread over several places in the Kaira and Ahmedabad districts, conducted in the autumn of 1937–38 and summer of 1938–39 and in the autumn of 1938–39 show, that strain No. 207 gave on an average 11 per cent. better yield than local, having given less yield than the local in only three cases. The tillering capacity and straw yield of 207 is also higher than the local. It is reported to be earlier than the local.

Castor.—The type S–20 was found pure for green stem and double bloom this year. Similarly S–5–35 and S–10 did not show any trace of either red-stemmed plants or spineless capsules. The results of the replication trials show that S–20 gave 12 per cent. and S–5–35, 20 per cent. higher yield than the local though the results are not statistically significant due to the unevenness of the soil. The results for oil percentage and number of beans in these types are consistent with those of the previous years and hence type S–20 can be now freely propagated in the district.

Experimental Station Work.

Surat Agricultural Station.

Seed Multiplication.—Owing to the re-organization of the Farm only 63 acres and 10 gunthas were retained for the experimental work and 109 acres were leased out to cultivators. However, the multiplication of seed was continued both on the Farm and tenant cultivators' area and the figures given below relate to the combined area.

Cotton.—1027 A.L.F. was grown on 64 acres and 26 gunthas with an average yield of 588 lbs. of seed cotton per acre on the farm area.

22,614 lbs. of resultant seed (12,370 lbs. of Stage II and 10,244 lbs. of Stage III) was given over to the Cotton Superintendent, Surat, for distribution in the selected villages of the Surat seed groups for further multiplication.

B.D. 8 cotton was grown on 11 acres and 39½ gunthas and the resultant seed 865 lbs. of Stage II and 3,604 lbs. of Stage III was supplied to the Cotton Supervisor, Broach, for distribution and multiplication in the Broach district.

Budh Perio No. 53 jowar was grown on 60 acres and 37½ gunthas. Average yield for the farm area was 1,047 lbs. per acre. The quantity distributed for seed is as under:—

18,918	lbs. to the Cotton Superintendent, Surat.
500	lbs. to Baroda State.
617	lbs. to Taluka Development Association, Jalalpore.
1,124	lbs. to other places.
788	lbs. yet to be distributed.
Total .. 21,947	lbs.

520 lbs. of Dhaincha seed has been distributed.

Manurial Experiment (Sulphate of Ammonia).—This has been continued from the year 1932–33. The results of yield, percentage increase or

decrease over no manure (control) and their economic value are given in the statement below :—

Treatments.	Yield per acre in lbs.	Percentage increase or decrease over no manure (control).	Extra cost of manuring and picking over no manure.	Value of extra yield over no manure (control).
			Rs. a. p.	Rs. a. p.
1. No Manure (control)	413·51	....	....	....
2. 10,000 lbs. farm yard manure once in six years	505·05	22·13	8 1 8	9 8 ¼
3. 10 lbs. Nitrogen in the form of sulphate of ammonia at sowing	401·34	−2·94	4 5 6	−1 3 5½
4. 20 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing	428·87	3·71	7 12 2	1 8 7
5. 40 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing	588·06	42·21	15 4 8	17 7 3
6. 10 lbs. Nitrogen in the form of Sulphate of Ammonia after stand	519·09	25·53	5 2 4	10 8 11
7. 20 lbs. Nitrogen in the form of Sulphate of Ammonia after stand	524·30	26·79	8 5 5	11 1 3
8. 40 lbs. Nitrogen in the form of Sulphate of Ammonia after stand	649·63	57·10	15 11 3	23 9 9½

Farmyard manure was applied this year and the extra cost includes one-third charges of manure and manuring and the picking charges of the excess yield. The experiment is not significant ; however 40 lbs. Nitrogen in the form of Sulphate of Ammonia after stand is significant over Control, 10 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing and 20 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing ; while 40 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing is significant over 10 lbs. Nitrogen in the form of Sulphate of Ammonia at sowing only.

Residual effects of manurial treatments to cotton on next jowar crop.— In grain no treatment is significant over any other and in fodder 40 lbs. Nitrogen in the form of Sulphate of Ammonia after stand is significant over general mean and other treatments except farmyard manure.

Cotton Green Manuaring Experiment.—The experiment reported in paragraph 6 (E) of the Annual Report for 1934–35 was continued.

Dhaincha plants were buried in the soil when they were 6 weeks' old. Their weight was as under :—

	Green stuff in lbs. buried per acre.
With manure	9,361
Without manure	7,834

The yield results are as under :—

Treatments.	Yield of seed cotton in lbs. per acre.	Percentage increase or decrease over control.
1. Cotton (control)	522·68	....
2. Cotton *plus* farmyard manure	566·22	8·33
3. Cotton *plus* farmyard manure *plus* Dhaincha ..	646·06	23·6
4. Cotton *plus* Dhaincha	577·94	10·75

The experiment is significant. Farmyard manure *plus* Dhaincha is significant over general mean and other treatments.

Residual effects of green manuring cotton on next jowar crop.—In grain farmyard manure *plus* Dhaincha is significant over control, farmyard manure and general mean.

In fodder farmyard manure *plus* Dhaincha and Dhaincha alone is significant over control and farmyard manure.

Jowar Green Manuring Experiment.—Owing to the favourable rains the experiment has been carried out successfully this year on the lines given in paragraph 6 (F) of the Annual Report of 1934-35.

Dhaincha was buried in after 43 days' growth and its average weight per acre was as under :—

	Green stuff buried in lbs. per acre.
With manure	12,840
Without manure	11,325

The yield results are as under :—

Treatments.	Yield in lbs. per acre.			
	Grain.	Percentage increase or decrease over control.	Fodder.	Percentage increase or decrease over control.
Jowar—Control	1,229·427	....	2,478·81	....
Jowar *plus* Farmyard manure	1,225·225	0·34	3,016·43	21·68
Jowar *plus* farmyard manure *plus* Dhaincha ..	1,341·805	9·14	4,495·48	81·32
Jowar *plus* Dhaincha	1,344·965	9·40	4,159·37	67·79

Grain.—None of the treatments is significant over any other.

Fodder.—Farmyard manure *plus* Dhaincha and Dhaincha are significant over general mean, control and farmyard manure. Farmyard manure is significant over control.

Residual effects of green manuring in jowar on next cotton crop.—The yield results are as under :—

Treatments.	Yield of seed cotton in lbs. per acre.	Percentage increase or decrease over control.
Control—No manure	489·04	....
Farmyard manure	501·98	2·64
Farmyard manure *plus* Dhaincha	1,096·34	124·18
Dhaincha alone	993·20	103·09

As last year no jowar crop could be taken in green manured plots, yield of cotton is very good this year. Farmyard manure *plus* Dhaincha and Dhaincha are significant over general mean, control and farmyard manure.

Rotational Experiment.—This is the fifth year of the experiment and was conducted as detailed in paragraph 40 of the Annual Report of 1935–36. The average weight of green stuff buried per acre was 21,170 lbs. and its height 34–52" when 90 days' old.

The yield results are as under :—

Treatments.	Yield of seed cotton in lbs. per acre.	Percentage increase or decrease over control.
(G) No manure (control)	468·07	....
(B) Cotton after Dhaincha	1,197·74	155·88
(D) Cotton after jowar	638·03	36·31
(F) Cotton after jowar	439·46	—6·11 (Has not received green manure).

Residual effects on the rotational crop of jowar. The results are as under :—

Treatments.	Yield in lbs per acre.		Percentage increase or decrease over control.	
	Grain.	Fodder.	Grain.	Fodder.
(H) Jowar after cotton (control) (G) ..	1,029·20	1,719·06	....	....
(C) Jowar after cotton (B)	1,287·35	3,150·32	25·08	83·26
(E) Jowar after cotton (D)	1,136·35	2,205·22	10·09	28·28

As the comparison of the treatments can be made only after the experiment has run the full rotational period of six years, statistical results are not worked out.

Soil analysis shows that green manured plots have more Nitrogen content than control plots.

Application of farmyard manure at the time of burying Dhaincha to help its rotting.—This is a new experiment started in 1937-38 with a view to see if farmyard manure applied just at the time of ploughing in of Dhaincha for green manuring helps its rotting. There are four following treatments replicated as many times and arranged in Latin Square method. Net area of each plot is 2·38 gunthas :—

(1) No manure—Control.

(B) Farmyard manure at 10 cart-loads per acre.

(C) Farmyard manure at 10 cart-loads per acre *plus* Dhaincha.

(D) Dhaincha.

Dhaincha was ploughed in after 3 months with B. T_2 plough and the plots remained fallow. Average height was 2·72 feet and weight of green stuff was 13,068 lbs. per acre. Next year cotton was grown over them and the yield results are as under :—

Treatments.	Yield of seed cotton in lbs. per acre.	Percentage increase or decrease over control.
No manure—Control	504·33	....
Farmyard manure	658·77	30·62
Farmyard manure *plus* Dhaincha	609·70	20·89
Dhaincha	437·44	—13·26

Weight of undecomposed matter in Dhaincha plots was 460·84 lbs. per acre as against 425·08 lbs. in farmyard manure *plus* Dhaincha plots. It means that applying of farmyard manure when Dhaincha is being buried does not materially help its decomposition.

Dairy.

Strength of the herd on 1st April 1938 was 103 and during the year under report the dairy was closed gradually as per Government Resolution, Revenue Department, No. 7934/33, dated 18th April 1938. The cows were sent to Chharodi when they got dry and the realization of sale of milk, etc., was as under :—

Year.	Total milk in lbs.	Total realization.	Quantity per rupee in lbs.
		Rs. a. p.	
1937–38	70,803	5,421 0 5	13·06
1938–39	26,469	2,528 5 9	10·4
Total realization of dairy animals ..		1,420 0 0	....

As the herd was removed by Chharodi by the end of September and all the records were sent alongwith, it is not possible to give detailed data about the performance of the herd or of individual cows. All the useful dairy deadstock of the book value of Rs. 133–12–0 was transferred to Chharodi.

Dohad.

According to the reorganization plan, an area of 47 acres and 27 gunthas was leased out and the remaining 20 acres and 30 gunthas were utilised for research work.

Maize.—Thirty-five samples collected from 22 villages of Dohad taluka and 6 villages of Jhalod taluka were grown on the farm for botanical study. A number of plants have been selected from these as well as from a plot of farm mass selected Sameri seed for further study.

Wheat—Comparative trials.—Pusa 4, Pusa 52, local Katha and Wajia were tested for yield in six randomized replications. There is practically no difference between Pusa 4 and Pusa 52 but the latter is rather late and as such Pusa 4 seems to be most desirable.

Groundnut—Varietal trials.—As per plan of the Imperial Council of Agricultural Research, four Coimbatore types, viz. 113, 186, 334 and 477 were tested with Spanish peanut as check in five randomized replications. The results show that No. 477 is not significant over local while No. 113, 186 and 334 are better than the Spanish peanut and No. 334 seems to be the best of the lot.

IV PROPAGANDA.

Ahmedabad District.

Trials in cultivator's fields—Cotton.—Wagad Segregate 4–1 was tried at 8 places in Viramgam taluka. At 5 places it failed due to early ceasing of rainfall, i.e. by the end of August. At one place, it gave higher yield than local while in the remaining two the yield of 4–1 was lower.

Segregate 4–1 and wagad 8 were also tested in one place in Dholka taluka where both of them yielded 7 per cent. more than the local.

Banilla is finding favour with cultivators of the Panchal tract in Dhandhuka taluka.

Bajri No. 207.—It was tried at 11 places in the district and yielded more by 16 to 36 per cent. This is appreciated by the cultivators and its demand is likely to increase.

Groundnut.—Magadi type gave favourable results at two places only out of five in Prantij taluka. Spanish pea-nut failed at all the five centres of Prantij taluka due to unfavourable season.

Castor.—S–20 has done very well in four out of five centres in Prantij taluka giving higher yield up to 50 per cent.

Manurial.—Trials of superphosphate on groundnut and wheat in Prantij taluka failed due to less rain.

Cultural.—Trials of wider sowing by two coultered drills 16″ to 18″ apart against local drill for sowing wheat created a good demand for the improved drill. The total area sown with it was about 7,000 acres in Dhandhuka taluka.

Fruit trees.—Mosambi trees planted in villages round about Ahmedabad in previous years are bearing now. The fruit are good and are liked by the people. Bor budding is taken up to a large extent.

Demonstrations and Shows.—A number of practical demonstrations were held at various places in the district showing the improved crops, working of improved implements, spraying insecticides, preparing silage, levelling, bunding, etc.

Insect pests.—Katra (hairy caterpillar) damaged the growing crops of jowar, bajri and cotton. The crops had to be resown in some places.

Mango hopper.—The damage due to this pest was very slight.

Distribution of seeds, plant, etc.

Sann	32,580	lbs.
Groundnut—Magdi and Spanish peanut	3,860	,,
Cotton—wagad 4-1, 7-1, 8 and Broach special	2,800	,,
Bajri No. 207	3,700	,,
Castor S-20	295	,,
Wheat—Pusa 52-7280) No. 224—12000)	19,280	,,
Rice K. 540	10	,,
Sulphate of Ammonia	4,952	,,
Superphosphate	453	,,
Sulphur packets	618	(Number).
Fruit plants	106	(,,)

The Ahmedabad District Agricultural and Livestock Association.—The Association is doing very valuable work by supplying improved implements, seeds, etc. at concession rates (10 per cent) and free transport, through the depots opened at five centres. It has 1 patron, 25 life members and 103 annual members with a fund of Rs. 12,500.

Kaira District.

Trials in cultivators' fields—Cultural.—wider sowing of cereals 16″ to 18″ apart as against 12″ local method and of groundnut 22″ to 24″ apart was carried out in 18 villages on an area of 224 acres of cereal and in 8 villages on an area of 865 acres of groundnut. The use of Broach harrow for preparing tobacco lands was widely popularized and was tried by 15 cultivators in 15 villages of Anand and Borsad talukas. 343 acres of groundnut were harvested with a special drilling harrow. An area of 38 acres in Kapadvanj and 37 acres in Mater talukas was ploughed by an iron plough, Cooper No. 27.

Varietal.—Wheat Nos. 224, 808, and Pusa 52 and 4, Bajri No. 207, Magadi groundnut and castor S-20 now have a natural spread in the district. A large quantity of cotton seed of B.D. 8 type in preference to Broach special has been given out to the cultivators in Mal lands of Kapadvanj, Thasra and Matar talukas.

Tobacco K-49 is now more popular in the district as a dry tobacco suitable for bidi.

Distribution of seeds, plants and manures, etc.

Wheat No. 224	4,280	lbs.
Wheat No. 808	400	„
Wheat No. 52	5,760	„
Pusa 4	160	„
Bajri 207	1,860	„
Groundnut, Magadi	9,690	„
Cotton B.D. 8	84,160	„
Cotton Broach special	3,800	„
Tobacco—K-49	144	„
Tobacco—G-6	25	„
Sann	10,900	„
Mosambi	874	(Number).
Mango grafts	523	„
Chiku	51	„
Banana suckers	14,200	„
Guava plants	1,273	„
Guava seedlings	186	„
Guava grafts	58	„
Lemon—kagdi	800	„
Shade trees	920	„
Plant pullers	192	„
Papaya	5	lbs.
Vegetable seeds	29	„
Sulphur packets	374	(Number).
Dust guns	9	„
Bone meal manure	6,825	lbs.
Denatured salt	28,280	„

Sulphur dusting.—The attack of mildew on cumin was severe this year. Dusting operation was carried out on 668 acres of Jiru crop against mildew in 68 villages and on 75 mango trees against mildew and hoppers in 7 villages. The treated crop of Jiru gave higher yield of about 60 lbs. per acre besides fetching Rs. 1-12-0 to Rs. 2 more per 40 lbs. for quality over untreated crop.

Horticultural propaganda.—For improving the country mangoes, 554 trees were side grafted. Cultivators were advised to cover mosambi fruits with craft paper bags against the attack of fruit fly. 1902 lemon trees were sprayed with fish oil rosin soap and tobacco decoction against

the attack of aphis, mites and scale insects. Two horticultural classes were arranged at Napa and Nadiad. About 400 cultivators took advantage of these. Horticultural operations such as grafting, preparing seed beds, manuring, jelly making, pruning, etc., were also taught to the primary teachers on the Nadiad Farm.

Roze killing.—With the help of a shikar officer specially engaged for the purpose, 475 nilgais and 375 pigs were killed. Two gun clubs have been formed with subscriptions from villagers and a necessary contribution from the village uplift grant and the Roze killing is done by shikaris paid from these funds.

Poultry improvement.—From the grants of village uplift a Government model farm is opened. 25 Rhode Island Red fowls were bought from Kosamba and distributed in the district. 9 Black Minorea cocks were also distributed. The villagers were also helped by the poultry kamgar in treating the sick fowls.

Demonstrations and Shows.—189 cultivators from 90 villages and 22 students from the New English School, Nadiad, took advantage of a demonstration held on the Nadiad Tobacco plot.

Anand Institute.—A preliminary inquiry for the selection of a site for the Institute was made and a complete recording of the owners of various survey numbers and valuation of crops, etc., in the selected site was carried out with the full cooperation of the enthusiastic local worker Mr. Bhagvandas Kashibhai Patel of Anand.

Broach District.

Cotton.—Distribution of B.D. 8 cotton seed now forms a separate scheme financed from the funds of the Indian Central Cotton Committee, Bombay, from 1st December 1938.

From the controlled area of 7096 acres, (535 acres and 6561 acres under Inner and Outer Reserved area respectively), 2,89,420 lbs. seed was purchased for distribution for sowing in 1939–40. Further 4,069 lbs. seed from the Surat Farm and 795 lbs. from the Broach Farm were supplied to the group and society people. In addition to above, 166,120 lbs. cotton seed was supplied to cultivators of Kaira and Panch Mahals including Baroda State.

In all 10,208 F.P. bales of B.D. 8 lint were produced out of which 3,254 bales from groups and societies were sold at a premium of Rs. 39 to Rs. 53 over Broach quotation and 6954 bales were sold by the ginowners at a premium of Rs. 30 to 43, thus the cultivators were thoroughly convinced of good qualities of B.D. 8 cotton. Moreover, B.D. 8 kapas was purchased by the gin-owners readily and without any hindrance at a premium of Rs. 2 to 4 per bhar of 1,020 lbs.

Jowar No. 8.—This variety which has been proved to yield 9 to 10 per cent. higher and to give fodder of better quality than the local is now spreading naturally in the district. (2000 acres against 1500 acres of last year).

Wheat No. 224.—The area under this was about 200 acres but due to shortage of rainfall and the attack of stem borer in the month of December, the yield was much below normal.

Groundnut.—This crop is spreading very slowly as it has not yet appealed to cultivators on account of heavy cost in harvesting due to sticky black soil. It is grown in about 100 acres.

Demonstrations and Shows.—Party demonstrations were held at the Cotton Breeding Station, Broach, Kervada, Haldar (Taluka Demonstration Centre), Kalla and Chavaj. The Dhaincha green manuring and bunding by cotton stalks to prevent erosion and other agricultural improvements were practically demonstrated.

Distribution of seeds, fruit plants, manures, etc.

(*a*) *Seeds*—

Jowar No. 8	1,010	lbs.
Groundnut	240	,,
Wheat No. 224	1,560	,,
Rabi bajri	380	,,
Suandhia jowar	40	,,
Paddy	1,000	,,
Castor seed	200	,,
Pusa peas	52	,,

(*b*) *Manures*—

Sann seed	20,520	,,
Dhaincha	540	,,
Udid	840	,,
Sulphate of Ammonia ..	3,360	,,
Castor cake	2,440	,,
Denatured salt	3,440	,,

(c) *Vegetable and Gardening*—		
Plantain suckers	450	Number.
Mango grafts	145	,,
Mosambi	437	,,
Lemon	160	,,
Cocoanut	90	,,
Other fruit plants ..	52	,,
Shade trees ..	55	,,
Papaya seeds (Madhubindu) ..	1	lb.
Green vegetables	1	,,
(d) *Insecticides*—		
Paris green	5	lbs.
Lead Arsenate	25	,,
(e) Sulphur packets	911	(Number).

Cotton Boll-worm Control.—Five counters and one agricultural sub-overseer were appointed for the intensive propaganda work in the Jambusar taluka from the funds of Indian Central Cotton Committee. Iron handle plant pullers were in greater demand this season, In all 229 iron handle plant pullers and 378 wooden handle plant pullers were sold.

Cotton market.—Preliminary propaganda through magic-lantern slides was made in 23 villages to convince the cotton growers about the advantages of a regulated cotton market. The selected site being objected to by some members and the time being short for all preliminary work, due to season being early, opening of the market had to be postponed, till next year.

Panch Mahals District.

Trials in cultivators' fields—Bajri No. 207.—It was found superior to local in grain yield by 16 per cent. It was early by about 15 days and uniform in maturity. Its fodder was also good.

Castor No. 20.—It did well in the trials.

Tobacco.—Harrisson special was tried. Its growth was excellent but owing to marketing difficulties, it is not likely to extend.

Sugarcane.—Co. 290 is recommended as it is superior in yield and gul quality.

Paddy.—K. 540 failed owing to insufficient rains.

Distribution of improved seeds, manures, plants, etc.

Jowar Budh Perio 53	200	lbs.
Cotton—B.D. 8	48,640	,,
Cabbage, etc.	29	ozs.
Gram (Yellow)	2,933	lbs.
Paddy K-540	340	,,
Nialo jowar	80	,,
Bajri No. 207	20	,,
Castor S-20	20	,,
Wheat—Pusa 4	80	,,
Spanish peanut	2,034	,,
Jowar Sundhia	40	,,
Berseem	8	,,
Maize	2,397	,,
Improved varieties of sugarcane ..	475,800	sets.
Sulphate of Ammonia	534	lbs.
Groundnut cake	350	,,
Sulphur packets	200	(Number.)
Arsenic packets	500	,,
Sann	280	lbs.

Demonstrations.—93 demonstrations including on the Dohad Farm were held showing the working of the Karachi ploughs, seed drills, iron leveller, blade harrow, ridge making with middle breakers etc., improved crops such as castor S-20, Bajri No. 207, tobacco Harrison special, sugarcane Co. 290, etc. In all 1,661 cultivators took advantage of these.

Classes to train social workers for showing improved methods were also held.

Village Uplift.—The Jhalod Agricultural Scheme financed from the village uplift funds was continued during the year. The main items of the work were demonstrating the working of improved implements, seed

distribution and its recoveries through the Mahalkari, remedial measures against field rats, showing utility of the leveller in bunding and levelling and supplying of guave seedlings raised from seeds.

Surat District.

Cotton seed multiplication and distribution.—The area controlled during the year was 11,756 acres including 865 acres grown with Surat Farm pedigree seed. The total quantity of kapas of 1027 A.L.F. cotton ginned was 5,611 bhars giving 2,242 candies of lint.

Seed production :—

		lbs.
Surat Farm produce	.. ..	22,614
Purchased from groups	.. ..	2,151,603
	Total ..	2,174,217

Out of the above stock, 678,572 lbs. were supplied to Rajpipla State and other miscellaneous indents received from outside and the remaining quantity of 1,495,645 lbs. were distributed in the district by opening 24 depots in the interior. Nearly 99,416 lbs. were supplied direct by the Hansot Co-operative Cotton Sale Society and from Vedchha gin. Thus the total seed distribution of improved 1027 A.L.F. comes to 2,273,633 lbs. through the Department.

There being demand for long stapled cottons this year, fairly good premium was obtained for 1027 A.L.F. cotton while selection 1A cotton fetched about Rs. 10 off Surat local in local market. Besides 1A was not much in demand. Thus by end of April, 1027 A.L.F. was almost disposed off while there remained a balance of about 4 annas crop (5,000 bales) of 1 A.L.B. with the Co-operative Sale Societies. Owing to the great difficulty in disposing off this stuff during the year, almost 80 per cent. of the Co-operative Cotton Sale Societies and almost all societies in the area south of the river Tapti changed their policy in favour of 1027 A.L.F. cotton.

The Cotton Transport Act of 1923 has now been amended restricting from the year 1940 the transport of kapas and cotton seed from the Olpad Taluka and part of the Chorasi north of the river Tapti into Surat area ; only half pressed bales will be allowed to be brought at Surat for full pressing under licences. This together with the doubling of the cotton duty by the Central Government for imported cottons created a good demand for long staple cotton, 1027 A.L.F. Thus out of 1,595,061 lbs. seed of 1027 A.L.F. supplied in the British area, 523,090 lbs. have been taken up by the Cotton Co-operative Sale Societies.

By passing of the Cotton Control Act of 1935, the Goghari cultivation has been completely eliminated but its place has been taken up by Selection 1A cotton in the area where inferior Goghari was previously grown.

Jowar Seed—Budh Perio 53.—The scheme of supplying farm seed of this improved variety at half concession rate to a selected cultivator in each of the four talukas, viz. Olpad, Chorashi, Bardoli and Jalalpore, has been in operation for the last four years with a view to spread this type rapidly in the district so that the seed may naturally spread in the district after five years' work. Five new centres in each taluka will be taken up for the fresh season next year covering the total number of 25 villages in each taluka mentioned above. The quantity of fresh seed supplied comes to 17,335 lbs. as against 18,673 lbs. of the last year.

Rice.—K. 184 tried in comparison with local Kada gave this year 49·6 per cent. higher yield per acre. On an average of 7 years' trial since 1932–33, K. 184 gave 202 lbs. more yield per acre than local Kada (1,441 lbs. per acre).

K. 226 type tried in Bulsar Taluka gave 3,200 lbs. paddy per acre while last year its yield was 2,600 lbs. per acre. Thus on an average of two years, this type has given 2,900 lbs. paddy per acre and can favourably compare with Navabi Kolam which yields 2,500 lbs. paddy per acre.

Wheat.—During the year Pusa 4 and Pusa 52 were tried in Bulsar Taluka. Pusa 52 failed. On an average of 7 years' trial since 1932–33, Pusa 4 gave 667 lbs. per acre. This type is observed to be rust resistant and has spread on about 70 per cent. of the total wheat area in the Chikhli Taluka.

Sugarcane.—Co. 213 variety now occupies more than 70 per cent. of the area under cane. The average yield of gul per acre varies from 6,000 to 8,000 lbs. according to the treatment.

P.O.J. 2878 and E.K. 28 are being tried since 1934–35. Both these varieties require 3 to 4 more waterings than Co. 213. E.K. 28 is more soft and delicate than P.O.J. 2878 and is susceptible to borer attack and thus its cultivation is rather restricted. P.O.J. 2878 requires careful skimming of scum which appears till the last operation of striking. The average yield of gul per acre for P.O.J. 2878 is 9,842 lbs. and for E.K. 28 is 9 218 lbs. P.O.J. 2878 has spread in all the four talukas of the South Gujarat tract. The trials of Co. 290, Co. 413 and Co. 419 laid out last year show that they have fared well in all the three plots. Co. 290 lodged heavily. The gul of Co. 290 was rather saltish, sticky and brownish.

A special Gulwa was called from Poona for construction of improved furnaces and working there with improved pans for better gul making at several gul making demonstrations held in the tract. Eight such new furnaces were constructed in Bulsar, Chikhli and Pardi talukas.

Fruit crops.—The grape fruit plants introduced last year are progressing fairly well. Out of 80 plants, 18 have perished. During the year a total of 37 tons of sulphur dust was used against mango hoppers resulting in profuse bearing of fruits.

Distribution of manures.—Permits for 47,840 lbs. denatured salt were secured for fruit growers of the tract. In addition to 70 tons of Sulphate of Ammonia, bone meal, fish and cakes are used by fruit, rice and cane growers on a large scale.

Distribution of seeds, plants, etc.

Sugarcane—P.O.J. 2878 and Co. 419 ..	40,000	sets.
Suckers of Kew and Queen pineapples ..	1,500	(Number.)
Khirni plants for grafting chikoo ..	500	,,
Mango grafts	200	,,
Paddy—K. 184	1,493	lbs.
Paddy—K. 540	85	,,
Paddy—Z. 149	210	,,
Wheat—Pusá 4 and 52	160	,,
Iron ploughs	2	(Number.)
S. L. type 2½" centrifugal pump ..	1	,,
Karamat type of power cane mill ..	1	,,
Improved Poona type pans	5	,,
Peerless dust guns	7	,,
Plant pullers	80	,,

Poultry.—Out of 14 Rhode Island Red cocks distributed during the year, 4 succumbed to diseases and the rest are doing well. A subsidy of Rs. 250 has been given to Sardar Khan Bahadur V. P. Bhiladwalla for a poultry farm from where an improved type of poultry will be supplied in the district.

Cotton Boll-worm Control Scheme.—This is the sixth year of the propaganda for carrying out a wide spread campaign to bring home to cultivators the advantages of uprooting cotton stalks immediately after the picking is over. 15 counters were appointed for the purpose early in March. The season being early by about a month, the work of uprooting was nearly over by the end of April. As in the previous year, the work was concentrated in three talukas, Chorashi, Olpad and Ankleshwar;

in the remaining talukas, the counters were posted to keep up the activities of the D partment. The total number of plant pullers sold were 1 552 (854 with wooden handle at Re. 0-12-0 each and 698 with iron handle at Rs. 1-4-0 each); the reduction in price being possible due to subsidies from Indian Central Cotton Committee and Surat district village uplift grants.

Goghari Survey.—This is the fifth year of field to field survey done with the help of 6 kamgars specially appointed for the purpose. In all 83 villages of Ankleshwar, Jalalpore and Bardoli talukas were surveyed covering a total area of 22,356 acres of cotton. It is gratifying to note that cultivation of Goghari cotton has been completely eliminated, its place now being taken up by Selection 1A in many villages of Bardoli and Jalalpore talukas through Co-operative Cotton Sale Societies of Olpad taluka and certain interested gin-owners.

Demonstrations and Shows.

Practical demonstrations for a week were arranged on the Surat Farm in November 1938—one day for each of the talukas of the district. 95 cultivators from Chorashi, Olpad and Jalapore talukas attended. There were no social workers nor primary school teachers. Crops grown under improved methods i.e. green manuring, low ridges, dibbling of cotton at wider distances and working of improved implements were shown to the visitors who were well impressed.

The Department also arranged the Agricultural Section in the Second Trades and Agricultural Exhibition held at Surat for a month from 29th April 1938. The Section included stalls for horticulture (fruits, fruit grafts, fruits products, etc.), improved seeds, manures insecticides and their appliances, land development, marketing and improved implements. They were made very attractive by the use of pictorial and descriptive charts and models. Prizes worth Rs. 121 for best field produce were distributed. The Exhibition was opened by Honourable Minister of Local Self-Government, Mr. L. M. Patil. In all about 100,000 people visited the exhibition during the period.

V.—ORGANIZATION.

Divisional Board.—Under the Chairmanship of the Assistant Registrar, Co-operative Societies, Nadiad, meetings of the board were held. The members as before took a keen interest in the discussions of subjects which were varied and which required considerable thinking.

Taluka Development Associations.—In all 10 associations have been working as reported in the previous year. Government subsidy for 9 associations was recommended. The work of the Taluka Development

Associations on the whole can be said to be satisfactory and it is now proposed to change the activities of these associations to Better Farming Societies.

Taluka Agricultural Demonstration Centres.—There are ten Taluka Agricultural Demonstration Centres in Gujarat division on the lands of the cultivators. The idea of opening these centres is to show the cultivators the methods of agricultural improvements so far achieved by the Department. Till the beginning of this year, experiments were conducted on the Government Farms or plots and the cultivators were invited to see the work done on them. In order to convince the cultivators that such improvements that are carried out and so demonstrated can directly be done on cultivators' fields and with their own efforts under our guidance, ten demonstration farms are thus opened on the cultivators' fields under the guidance of the Department. At every centre, a kamgar drawn from the Agricultural Class is placed at different centres. The centres are directly under the management of the District Agricultural Overseer of the district and kamgar has to work according to the guidance of the graduate overseer. At present, the cropping of the plot is prepared which suits the locality and the cultivation is done according to the existing practices of the tract but improved upon by the introduction of the advocated proven items of the improvements achieved by the Department. Improved strains of different kinds of crops such as Pusa 4, Bajri 207, ground-nut, tobacco, rice, sugarcane, vegetables, fodder, etc., are introduced on these demonstration plots. In many cases the cultivators are to be supplied with the improved variety of seeds to be introduced at Departmental cost. The landlord cultivator of the plot having undertaken to supply the improved seed to roundabout cultivators of the plots, a large area round about the demonstration centre will be covered with the improved seed. Free use of the improved implements has also to be made available to the landowner cultivators for use of these demonstration plots for showing their advantageous working over the indigenous ones. On some of the plots manurial trials are also taken on certain crops showing the advantages of green manuring, cake manuring and artificial manuring.

On most of the demonstration plots small parties of cultivators are invited at each new operations to convince them of the beneficial results that could always be achieved by better tillage, green manuring, wider sowing and using improved seed and implements and in some cases beneficial effects through the judicious use of artificial manures.

The advantages derived from these demonstration centres are that the cultivators of roundabout villages have shown their desire to indent seed of the demonstration plots and if this so continues, it is hoped that, more and more of the area will be covered by the pure and improved seed in course of time and that better methods of farming and use of better implements, etc., could be taken up by them gradually.

The following are the Taluka Demonstration Centres in Gujarat Division together with their area, during 1938-39 :—

Serial No.	Name of the Centre.	Area.	
		A.	g.
1	Dhamdachhi	12	1
2	Afwa	21	30
3	Ankleshwar	19	0
4	Haldar	32	32
5	Derol	7	29
6	Anand	11	16
7	Mehmedabad	14	0
8	Vatwa	22	13
9	Detroj	21	37
10	Transad	21	12

VI.—AGRICULTURAL SERVICE.

Supply of Premium Bulls.—Twenty breeding bulls have been supplied in the Gujarat Division from the funds of His Excellency the Viceroy's Gift Bull Scheme. Thus, with the number previously supplied, total number of 23 cow-bulls and 25 buffalo-bulls are working in the Gujarat Division.

VII.—EDUCATIONAL WORK.

The propaganda staff as usual inspected and examined Agricultural Bias classes and conducted Vernacular Final Examination with Agricultural Bias in all districts of the Division.

Bunding Classes.—Bunding classes at Gadi in Prantij taluka of Ahmedabad district and Mirakhedi in Jhalod taluka of Panchmahals district were conducted to give practical instruction in bunding and soil erosion.

Classes for practical training in Agriculture for primary teachers were conducted during the year at Surat, Nadiad and Dohad.

VIII.—PUBLICITY.

Staff members contributed articles to *Khedut, Kheti and Sahakar* Magazine published by the joint committee representing interests of both Agricultural and Co-operative Departments at Surat.

The staff on the whole worked very satisfactorily.

(Signed) H. G. BALUCH,
Deputy Director of Agriculture,
Northern Division, Surat.

Programme of work to be done under the Deputy Director of Agriculture, Gujarat, Surat, for the year 1939-40.

RESEARCH.

SURAT.

(a) Cotton.

I.—Isolation of a type or types equal to 1 A.L.B. in seed cotton yield and ginning percentage and equal to 1027 A.L.F. in staple qualities from the following material :—

(1) Study of economic characters of the nine selections retained—S. 9-1-3, S. 9-1-4 and S. 16 (1932-33); S. 7, S. 8 and S. 14 (1935-36) and S. 4, S. 5 and S. 11 (1936-37)—in progeny rows with 1027 A.L.F. and 1 A.L.B. as check after every four rows of plant-to-row cultures of selected plants is to be continued.

(2) Study of the promising material from 1938-39 explored—in all seventeen collections, finally retained :—S. 17, S. 23, S. 24, S. 27, S. 28, S. 29, S. 30, S. 35, S. 36, S. 37, S. 38, S. 39, S. 42, S. 44, S. 45, S. 46 and S. 47—in single lines with 1027 A.L.F., 1 A.L.B. and B.D. 8 as checks is to be continued.

(3) Study of the twelve collections made on the farm crop—ten, from 1027 A.L.F., one from B.D. 8 and one from Surtee local, is to be continued.

(4) Further explorations of the desired material from the district and specially from the border line of 1 A.L.B. and 1027 A.L.F., or B.D. 8 and 1 A.L.B. are to be done only this year as the whole area south of Tapti is to have 1027 A.L.F. in future.

II.—Intensive study by further selection from the pure lines in 1027 A.L.F. (25 plants), Segregate 8-1 (15 plants) and Selection 1 A.L.B. (10 plants) in triplicates with their respective checks is to be continued.

III.—Study of the crosses and backcrosses :—

(1) Seventy-two cultures taken from the five done previously :—

Name of the cross	No. of selected plants retained
(1) Segregate 22-3-2	6
Segregate 22-3-2-8	13
(2) Segregate 8-1 × 1027 A.L.F. } F5	17
(3) Segregate 8-3 × 1027 A.L.F. } F6	....
(4) <(B. D. 8 × 1 A.L.B.) F1 × 1027 A.L.F.>F6	25
(5) <(1027 A.L.F. × Gaorani 6) F1 × 1027 A.L.F.>F1 × 1027 A.L.F. F3	3
	72

(2) The three F1 crosses done last year :—

(1) 1027 A.L.F. × Broach B.D. 8 backcross Segregate 1-6.

(2) Segragate 8-1 × Broach B.D. 8 backcross Segregate 1-6.

(3) Segregate 22-3-2-8 × Broach B.D. 8 backcross Segregate 1-6, are to be continued.

IV.—Comparative yield trials of 1027 A.L.F., 1 A.L.B., Segregate 8-1 and S. 9-1-4 (B.D. 8 is dropped and Selection 9-1-4 added) are to be continued.

V.—Production of selfed seed of 1027 A.L.F. (300 Lbs.), 1 A.L.B. (100 lbs), Segregate 8-1 (30 lbs). and B.D. 8 (30 lbs.) is to be continued.

VI.—Maintenance of types—thirty types are to be continued.

VII.—Sowing of cotton with wal for economising seed rate to secure germination of cotton seeds due to the lifting of the soil crust by wal seedlings is to be continued. Two and three cotton seeds per dibble will be used with wal.

(*b*) *Jowar.*

I.—Maintenance of types is to be continued.

II.—Production of selfed seed of Budh Perio 53 is to be continued.

Interspecific Hybridization Surat.

I.—Maintenance of twenty-three hybrids and their twenty-seven first backcross progeny plants.

Year of origin.	Hybrid Nos.	
1935-36	.. No. 2-1, 2-2, 2-3, 2-4, 5-5, 5-7, 8-2, 11-1, 11-3, 8-1.	10
1936-37	.. No. N. 2-1, N. 3-1, N. 5-1, N. 7-1, N. 9-1, N. 15-1, N. 16-1, N. 18-1, N. 19-1, N. 22-1.	10
1937-38	.. No. M. 1-1, M. 1-2, M. 2-1 ..	3
		23
	First backcross progeny plants.	
1937-38	.. B.C. No. 1, 25, 4, 5a, 6, 9, 10, 11a, 12, 13, 14, 15, 16, 31, 19, 20, 21, 22, 36. (1937-38 ratoons).	19
	B.C. No. 39, 40, 45, 46, 57, 68, 73, 74 (from 55 seeds).	8
		27

II.—Vegetative propagation of the hybrids and their first back-cross progeny plants.

By cutting.

By grafting .. Simple approach graft on a hardy stock and bottle-grafting will be continued. 49 grafts from last year would be maintained further.

III.—Fresh crossing work between the best Sea-Island and Egyptian types with 1027 A.L.F. for exploring the possibility of combining the staple quality.

49 F1 seeds of last year will be sown. Further crossing work to be continued.

IV.—Inducing fertility in sterile hybrids by :—

(1) Backcrossing is to be continued in sterile hybrids. Selfing in backcross progenies wherever possible, would be tried.

(2) Chemical treatments with Colchicine and Acenaphthene, (to be tried this year only) for producing polyploidy in sterile hybrids.

Chemical treatments :

By immersion and drop methods with Colchicine solutions will be given to sterile hybrids for inducing polyploidy :—

(1) *Immersion method.*—Colchicine solutions ranging from 2·0 per cent. to 0·06 per cent. for 1 to 12 hours will be tried.

(2) *Drop method.*—Colchicine solutions ranging from 2·0 per cent. to 0·5 per cent. will be tried for a number of times with varying intervals of ½ day to 15 days.

(3) *New Item.*—Exploration of the economic possibilities of Colchicine treatment to cottons and its utility in crossing and back-crossing for inducing polyploidy 11 pure types of different species and 21 crosses in between them will be treated with Colchicine for inducing doubling of chromosomes with a view to build up Auto-polyploids and Allo-polyploids. The possibility of such work will be explored. Germinated seeds will be treated with Colchicine solutions ranging from 0·125 per cent. to 0·01 per cent. dipped once and twice and sown after 6 and 12 hours.

Acenaphthene will be tried by putting the growing shoots in tubes covered with sublimated particles of Acenaphthene inside for varying periods of 12 hours to 48 hours.

V.—Study of the progeny of hybrids, first backcross progeny plants and their other promising material and selection from them for their economic characters :—

(1) 49 seeds of fresh crosses between Sea-Island and 1027 A.L.F.

(2) 55 seeds of hybrids obtained by backcrossing from 13 hybrids.

(3) Selfed and backcross progeny of 9 backcross plants. B.C. No. 1, 25, 10, 20, 21, 22 old and 39, 68, 73 new.

(4) Backcross progeny of 6 backcross plants, B.C. No. 9, 12, 13, 36 old; and 40, 74 new.

(5) Backcrosses of B.C. No. 39, 36, 1, 25, 74, 10 and 22 with Sea-Island.

(6) Following 76 first and 43 second best selected plants from the selfed progeny and from backcross progeny grown last year :—

——	First best	Second best
B.C. No. 1 × Maarad. F1	1	2
B.C. No. 25 × Maarad. F1	2	2
B.C. No. 10 × Maarad. F1	1	1
B.C. No. 12 × Maarad. F1	....	1
B.C. No. 21 × Maarad. F1	2	8
B.C. No. 22 × Maarad. F1	11	9
Maarad × B.C. No 1. F1	....	1
Maarad × B.C. No. 21. F1	3	1
Maarad × B.C. No. 22. F1	3	1
Sea-Island × B.C. No. 1. F1	....	1
Sea-Island × B.C. No. 25. F1	1	....
Sea-Island × B.C. No. 10. F1	....	1
Sea-Island × B.C. No. 21. F1	5	1
Sea-Island × B.C. No. 22. F1	5	3
Egyptian × B.C. No. 1. F1	1	1
Egyptian × B.C. No. 22. F1	5	1
Exotic. 3 × B.C. No. 1. F1	2	1
Exotic. 3 × B.C. No. 22. F1	4	1
B.C. No. 22. Selfed progeny	30	7
	76	43

(7) *New Item.*—Trials of promising backcrosses and their progeny at various stations interested in growing American cottons.

Selfed seeds of :—

(1) 4 first backcross plants, viz., B.C. No. 25, 10, 21, 22.

(2) 10 plants of selfed progeny of B.C. No. 22.

(3) 5 plants of B.C. No. 22 × Maarad F1 are supplied to each of the following :—

(1) Institute of Plant Industry, Indore.

(2) Cotton Research Botanist, Lyallpur.

(3) Cotton Breeder, Sind, Murpurkhas.

(4) Cotton Specialist, Coimbatore.

VI.—Collection of cottons—Foreign cultivated and wild types for crossing and backcrossing with G. herbaceum and backcross material.

(1) Exotic cottons, Sea-Island, Egyptians already collected and surviving are to be continued as ratoons.

(2) Exotic cottons, 3 wild types—G. Davidsonii, G. Anomalum, G. Harknesii surviving, are to be continued as ratoons.

Broach.

Cotton.

I.—*Selection* :—

(1) From hybrids :—

(1) Testing for wilt-resistance and economic characters—856 cultures in all (in progeny rows), 33 from 1 and 53 from 2.

	Family.	Culture.
(1) From straight crosses :		
1. (B.D. 8 × G.A. 26) F9	6	22
2. (B.D. 8 × S. 7-1) F7	1	6
3. (B.D. 8 × N.S. 12) F5	2	5
		33
(2) From back crosses :		
1. <(B.D. 8 × G.A. 26) F1 × B.D.8)>F7.	7	47
2. <B.D. 8 × (B.D. 8 × S. 12-1) F1>F5.	1	6
		53

(2) Study of F1 of the following five crosses :

(1) For earliness :

1. (B.C. F6-1-6 × 3010-2-9).
2. (N.S. 12 × 2964).
3. <N.S. 12 × (N.S. 12 × 2964)>.

(2) For less vegetative growth :

1. (S. 7-1 × B.C. F6-1-6).

(3) For yield :

1. (N.S. 12 × B.C. F6-1-6).

II.—*Comparative Trials :—*

(1) For wilt-resistance—in heavily wilt infected soil—3 best plants from each of the following four segregates with B.D. 8 (resistant) and 1 A.L.B. (susceptible) as checks (in nine randomized replications in rows as per split plot technique.

Note.—The nine segregates have been found highly wilt resistant, hence, no further testing was necessary.

	Cross.	Segregates.
1.	(B.D. 8 × S. 7-1) F7	10-15-3-2
2.	<(B.D. 8 × G.A. 28) F1 × B.D. 8>F7..	7-29-1-1
3.	<(B.D. × (B.D. 8 × S. 12-1) F1>F5 ..	3-1-3

(2) For economic characters including yield in wilt free soil, 3 plants from each of the segregates under (1) with B.D. 8 as check (in nine randomized replications in rows as per split plot technique).

(3) For yield (including spinning test and valuations by local merchants)—in wilt free soil—bulk seed of eleven segregates (from the following four crosses) with B.D. 8 and Broach Local as checks (six randomized replications in plots).

	Cross.	Segregates.
1.	(B.D. 8 × G.A. 26) F8	76-1 76-12
2.	<(B.D. 8 × G.A. 26) F1 × B.D. 8>F6 ..	1-2 1-6 5-18 6-20 6-25 7-29-1-1 99B-1-1
3.	(B.D. 8 × S. 7-1) F1	10-15-3-2
4.	<B.D. 8 × (B.D. 8 × S. 12-1) F1>F4 ..	3-1-3

III.—*Maintenance of Types :—*

In all sixteen types—three Broach Deshi, six Goghari, B. 9-1; N.S. 12, N S. 49; Viramgam S-7-1 and S. 12-1 and two mutants—3-4 celled and 4-5 celled—are to be maintained.

IV.—*Seed Multiplications :—*

(1) B.D. 8 to be multiplied on one acre :

1. Selfed (about 200 lbs. only).

2. Open fertilized—quantity available—for supply to the B.D. 8, Seed Distribution Scheme.

VIRAMGAM.

Cotton.

I.—*Selection :—*

(1) From local Wagad :—

(1) Testing in progeny-row-culture for economic characters—eleven promising families—

(1) Eleven promising families—96-3, 98-3, 99-3, 99-4, 101-5, N-66-2, N-87-2, N-89-2, 115-1, 116-1 and 126-1 each one having five progenies, and fifteen individual plants selected from six families—

Families—96—99—101—115—126—141.

Number of plants—6, 2, 2, 2, 2, 1.

(2) Seven promising families—163, 209, 261, 293, 305, 314 and 369 (and each having five progenies).

Two families—183 and 186 for earliness (and each having three progenies).

Nine individual plants coming from four families—165 (1), 167 (3), 260 (2) and C5 (3).

(2) From hybrids :

(1) Testing in progeny row cultures—four hybrid families—H.S. 12-1, H.S.B. 1, H.S.B. 10, H.S.B. 15. Sixteen individual plants from eleven cultures :—

Cross.	Number of plants.
(W. 8 × B.D. 8) F5	1
(W. 26-2 × 1027 A.L.F.) F6	9
(4-1 × B.D. 8) F4	2
[(W. 8 × B.D. 8) F1 × 1027 A.L.F.] F4 ..	1
W. 12 × B.D. 8) F8	3

(2) Testing in progeny-row-cultures—22 early plants selected from [<W. 8 × (B.D. 8 × 1027 A.L.F.) F2>F1 × R. 22] F1.

(3) From backcrosses—progeny-row testing of :

1. 33 plants from [(W. 8 × Surat 22-3-1-3) F1 × W. 8] F1.

2. 8 plants from [<W. 8 × (B.D. 8 × 1027 A.L.F.) F2 F1>× W. 8] F1.

(4) Selection for earliness combined with other economic characters from the backcrosses—

(W. 8 × Russians) F1. .. ..
(W. 8 × Iranians) F1. .. .. } × wagad types 99 or 101
(W. 8 × East Iran Herbaceums) F1. .. or Seg. 4-1.
(W. 8 × Early Herbaceums) F1. ..

and also from the F2 population raised from important F1s.

(5) New items—

1. Nineteen individual plants from Cutch and 4 bulk samples from Cutch.

2. Forty-one individual plants and 12 bulk samples from Baluchistan (received from the institute of plant Industry, Indore).

II. *Comparative yield trials :—*

(1) From the bulk seed of 18 families—96-3, 98-3, 99-3, 99-4, 101-5, N-66-2, N-87-2, 116-1, 163, 209, N-89-2, 261, 293, 305, 314, 369, H.S. 12-1 and H.S.B.-1 with Wagad 8, Segregate 4-1 and local Wagad (replication in rows randomized).

(2) Wagad 8, Seg. 4-1 and local Wagad (replications in randomized plots).

Jowar.

I.—Yield trial of four types—8-2, 10-2, 11-4 and 3-4 with local Chhasatio and local Utavali.

Jowar—contd.

II.—Progeny-row testing of—

(1) the additional selections tested last year—

		Families.	Progenies.
(*a*) Chhasatio :			
1	.. .. ..	C-1	4
2	.. .. ..	C-2	8
3	.. .. ..	C-18	4
4	.. .. ..	C-21	4
			20
(*b*) *Utavali* :			
1	.. .. ..	U-1	4
2	.. .. ..	U-15	4
			8

(2) the families grown last year—

	Families.	Progenies.
(*a*) Out of 31 of Chhasatio ..	15	35
(*b*) Out of 17 of Utavali ..	14	43

(3) the ear-heads selected from bulk-samples collected and grown last year—

	Ear-heads.
(*a*) Chhasatio	25
(*b*) Utavali	25

III.—Yield trial and behaviour of—8-2, 10-2 and 11-4 on the Northcote Cattle Breeding Farm, Chharodi.

NADIAD.

Tobacco.

I. *Selection of types*—

(1) Bidi :—

(*a*) Keliu strains :—

(*i*) Character study of two selections (with local as check) including yield, plant-to-plant in rows in triplicated groups.

(*ii*) Comparative yield trials—2 Selections—K. 24, K. 49, II—6-2-1 *v.* local are yet to be continued for further trial.

(*b*) New varieties added this year :—

(*i*) Guntur local or White Ash (new item recommended by Bombay Government).

(*ii*) Saijpuriun variety which is famous for its smoking, chewing qualities needs investigation as a new item.

(*iii*) Nipani variety which is famous for its smoking quality (sweet) needs investigation under Kaira conditions.

(2) Cigarettes :—

(*a*) Character study including yield—plant-to-plant study in rows only :

(*i*) *Varieties.*—Previous stock—four—Harrison Special, Acock, white Burley, white Burley Selection 1, are to be continued.

(*ii*) *Introduced during 1938-39.*—Seven varieties—Hyckory Pryor, Gold Dollar, Lizard Tail Orinoco, Mary Land, Cash, White Burley (Kelly), White Burley (Yellow twist).

(*iii*) *New introductions.*—Two—

(*1*) Bonanza (U. S. A.), Harrison Special No. 9 (Lam Farm, Guntur)—the seed is received already.

(*2*) New introductions—seeds to be ordered for trials :—

1. From U. S. A.	..	Jamica White Stem Orinoco Virginia Bright Yellow Pryor
2. From Turkey	..	Cavalla Samsoun Ayoussolouk

as they are said to do well in Alkali soils.

(*iv*) Study of—

Red Burley (White Burley × P. 45) × white Burley—this backcross was made in 1936-37, was studied as F1 in 1937-38, was not studied in 1938-39 and is to be studied for its refined qualities in both Bidi and Cigarette smoking.

II —*Comparative Economics.*—

Bidi v/s Cigarette tobacco growing 3 acres under each Kelin 49 and Harrison Special—is to be continued in its second year.

Note.—Only the standard method of flue-curing is to be used and no other method is to be tried.

III.—*Maintenance of pure lines.*—Four—

G. 6, P. 45, II—6-2-1 and N-1-5 for its vigorous growth.

IV.—*Successful raising of tobacco seedlings.*—

(1) By use of Kantan shed for protecting seedlings from heavy rains and strong sunshine v/s open.

(2) By using fungicides for controlling damping off.

V.—*Multiplication of selfed seed.*—

G. 6, K. 49 and Harrison Special.

Bajri.

I.—*Character-study plant-to-plant in rows in a single series contributing to.*—

(1) Purification : (1) (*a*) Productive tillering, (1) (*b*) head length (1) (*c*) head thickness and (1) (*d*) main head grain weight—2 units from each of the 17 selections comprising 12 from 207, 4 from 206 and 1 from 251 with 207 as check.

(2) Yield determination :—

Of each of the 4 selections—207-10-13, 207-8-1, 207-26 and 206-18—twenty-five high yielding plants with 207 as check for every four rows.

(3) Comparative plant-to-plant study of the local v/s St. 207 and 207-8-1. It is a relative study for determining the superiority of selections over local as the local could not be included in (2) for fear of vitiating the purity of others.

II. *Comparative yield trials.*—

Six sub-selections—207-8-1, 207-8-3, 207-10-3, 207-10-13, 207-26-5, and 206-18-5 with St. 207 as check—using Latin Square method.

III. *Maintenance of the Selections.*—

(1) Old : 66, 128, 206 and 207.

(2) New mass selections to be done as in the case of maize.

IV.—*Production of the selfed seed.*—

From (207–8–1) 48, (207–10–3) 26 and (207–10–13) 4.

V. *Seed multiplication.*—

From 207–8–1—both in summer and autumn.

Castor.

Multiplication of selfed seed.—

S (20–9–18) 6 and S–5–35 being the highest yielders are to be selfed for seed distribution.

DOHAD.

Maize.

I.—(1) Selections made from the village samples etc. grown during 1938–39 to be grown and studied for further purification and selection work.

(2) Study of the plant and methods of selfing.

(3) Some more samples are to be collected anew and grown for selfing and study.

(4) Seed obtained from America is to be tried and studied.

II.—Mass selected Farm Sameri seed is to be multiplied, detasseling undesirable plants, roguing, etc.

Wheat.

I.—Some of the types grown in 1938–39 are to be maintained along with some seed from America.

II.—Trials of Pusa-4, Pusa-52, Pusa-111, Pusa-80-5 and Pusa-101 are to be made in randomized replications in 5×5 Latin squares.

III.—Pusa-4 wheat is to be multiplied.

Groundnut Trials.

Madras varieties are to be tried with Spanish peanut as planned out by the Imperial Council of Agricultural Research.

SURAT FARM.

I.—*Last year's experiments.*—

(1) Yield trials of jowar varieties on about two gunthas area on the farm to be continued.

(2) Cotton Manurial Experiment (Sulphate of Ammonia) to be dropped as its results are decisive ; but its residual effects on jowar crop to be seen for this year.

(3) Cotton green manuring and its residual effects on next jowar crop—to be continued.

(4) Jowar green manuring and its residual effects on next cotton crop to be continued.

(5) Rotantional experiment—to be continued.

(6) Growing of Dhaincha varieties including selections made by Mr. M. I. Patel, B.Ag., for selection work and tests to be continued.

(7) Trial of sann seed (Crotalaria juncea L.) from Jawa to be continued as sufficient seed has been available only this year.

(8) Trials of Ridgers devised by the Agricultural Engineer to the Government of Bombay, Poona, to be improved upon by Mr. P. J. Patel, and then further trials to be taken.

II. *New Experiments.*—

(1) Separate and combined application of Sulphate of Ammonia and inter-row green manuring with Dhaincha in cotton—to compare their effects singly or jointly on the yield of cotton.

(2) Spacing experiment for cotton—to determine the value of dibbling over drilling, wider spacing over narrow spacing and cross interculturing over one way interculturing,

(3) Trial of Napier grass as recommended by the Director of Agriculture, B. P., Poona, for green fodder for cattle which can be grown successfully on light soils as tried in Mysore State.

(4) Trial of Allan-Gandhi Harrow with new adjustments made by Mr. M. I. Patel, B.Ag., as instructed by the Director of Agriculture during his visit.

(5) Conducting replication tests on 10 guntha plots of 1027 A.L.F., Selection 1A, Long Boll and Segregate 8–1 on the tenant cultivators' area—jointly with the Cotton Breeder, South Gujarat, Surat.

APPENDIX G.

Summary of work done under the Professor of Agriculture, College of Agriculture, Poona, from July 1938 to June 1939, i.e. for the year 1938-39.

Charge.—Mr. B. S. Patel, I.A.S., held the post of Professor of Agriculture, during the year excepting the period from 25th May to 19th November 1938 when he was deputed as Director of Agriculture, Bombay Province, Poona, when Rao Bahadur V. A. Tamhane acted as Professor of Agriculture.

2. *Staff.*—Mr. H. G. Baluch continued to work as Assistant Professor of Animal Husbandry and Dairying and Manager, Agricultural College Dairy, Kirkee, up to 19th May 1938. He was relieved by Mr. K. S. Kulkarny who held the charge, in addition to his own duties up to 25th May 1938 when Rao Bahadur V. A. Ramhane took over the charge and held it, in addition to his own duties until 19th June when Mr. M. M. Desai was appointed to act for Mr. H. G. Baluch.

Mr. K. S. Kulkarny held the charge of the office of the Assistant Professor of Agriculture up to 25th February 1939 when he was relieved by the Professor of Agriculture, who held the charge of the post, in addition to his own duties up to 9th June 1939 when Mr. H. B. Kulkarni was appointed to act for Mr. K. S. Kulkarny.

Messrs. H. G. Baluch and K. S. Kulkarny were relieved as they were appointed to act as Deputy Director of Agriculture, Surat and Dharwar, respectively.

Mr. H. B. Kulkarni worked as Superintendent, Agricultural College Farm, Poona, and first lecturer in Agriculture until he was appointed as Assistant Professor of Agriculture.

Mr. C. N. Dave, Lecturer in Dairying was transferred to the Live-stock section from 3rd October 1938 when Mr. J. J. Patel joined. Mr. J. J. Patel resigned to take to private business in Dairying on 28th April 1939 and Mr. B. D. Patel joined as Demonstrator in Dairying on 29th May 1939.

It may be noted that there have been too many changes and the vacancies have not been filled up for some time. In future it is desirable not to transfer any member of the staff without a substitute in the interest of the teaching and other works.

A. Teaching.

The Agricultural section including Animal Husbandry and Dairying has 40 per cent. of the teaching work of the College. The new B.Sc.(Agri.) course has been through the 4 years and this year we have had the second batch of the graduates under the new course. However, some defects have been noticed in the course. Firstly the course is too heavy. Secondly the arrangement of the course is unbalanced to the extent that very important subject of Animal Husbandry and

Dairying has been all packed up in the final year with the result that the students get very poor chance of learning or absorbing the subject. Thirdly, due to the reduction of 3 Demonstrators in the staff of the Agricultural section since June 1932, the practical work in Agriculture and Animal Husbandry and Dairying has materially suffered in two ways. Firstly for want of staff actual periods for practical work had to be reduced. Secondly the periods actually provided were not effectively used as for want of staff the class was divided into fewer but bigger batches having 20 to 30 students in each batch. Such a large batch on the field or Dairy makes the practical teaching more superficial than real.

The reports of the Examiners at the University Examinations of March 1937–38 confirm these remarks. Fortunately the Government have also desired to intensify the practical training in Agriculture and the College authorities have been busy to remedy the above defects. The College terms have been so extended that about 6 weeks in the first year, 3 weeks in the second year and 6 weeks in the third year can be entirely devoted to the practical work in Agriculture and Animal Husbandry and Dairying. Besides the college courses are being rearranged to give proper place and importance to the teaching of Livestock and Dairying. However, neither the re-arrangement of the course nor the extension of the term can be of much use unless there is sufficient staff to engage the smaller batches of the classes effectively for the practical work.

Special courses.—Seven students underwent the practical course in Dairying and finished it. Seven students underwent the Special practical course in Crop-production on the College Farm. Three of them were from Kashmir, one from Kathiawar and the rest from the Deccan.

At the time of reporting, 5 students are under going the special practical course in Crop-production on the College Farm; seven more who applied late were refused admission. It is encouraging to find that demand for such a training is increasing.

Practical demonstrations accompanied by lectures were given at the College Dairy to about 250 students from various outside institutions, such as Agricultural Schools, Agricultural bias classes, Training College for Men and Women, Seva Sadan Society, Poona, and Urdu School.

Agricultural staff attended to agricultural and Dairy work in connection with the training class for Revenue Officers.

5. *College Farm.*—The college farm continued its primary function of giving training in agriculture to the College students. Further, it afforded facilities of land and labour to different research sections of the College for their field Research work. It maintained a growing crops museum, both in the *Kharif* and the *Rabi* seasons. The students of this College and also a very large number from various outside educational institutions took full advantage of this museum. The implement museum consisting of a variety of bullock worked agricultural implements continued to be maintained.

(*a*) *The Season.*—The year under report experienced in the history of the farm the heaviest rainfall of 38·36 inches. The anti-monsoon and S. W. monsoon rains were timely. All field operations were carried out at their proper times. The heaviest fall of rains in the history of the farm namely, 19·20 inches of the N. E. monsoon was received between the 15th September 1938 and 8th October 1938. The heaviest showers of 5·36 inches and 4·21 inches occurred on 19th September and 8th October 1938. These excessive September and October rains caused considerable soil erosions and damage to standing crops. The yields were reduced considerably. Bajri flowers were washed down and later on seeds sprouted on the ear heads.

The yields per acre of some of the important crops were as under :—

Dry Crops.

Serial No.	Name of crop.	Outturn per acre in lbs. Grain.	Fodder.
			Dry.
1	Bajri, Tur and Matki.	656	1,463
		356	395
		37	19
2	French beans	6,076 (green pods.)	6,860 green fodder.
3	Chillies (Dry) St. C. 9	2,000 dry.	
4	Groundnuts—		
	Spanish pea-nut ..	1,076 dry pods.	
	Kopargaon No. 1 ..	1,972 ,,	
	Kopargaon No. 3 ..	1,456 ,,	
	Big-japan ..	1,684 ,,	
5	*Cotton*—		
	(*a*) Jarilla ..	443	(seed cotton).
	(*b*) 1027 A.L.F. ..	963	,,
	(*c*) B.D. 8 ..	638	,,
	(*d*) Wagad ..	440	,,

Irrigated Crops.

Serial No.	Name of crop.	Outturn per acre in lbs.
1	Brinjals ..	36,624 green fruits.
2	Cabbage—	
	(*a*) With Onionised water—	
	(*a*) (i) ..	8,007
	(*a*) (ii) ..	5,371
	(*b*) Without Onionised water—	
	(*b*) (i) ..	4,611
	(*b*) (ii) ..	4,765
3	Clover (Egyptian) ..	3,437 green fodder.
4	Cucurbits (Kharif)—	
	Dudhia, Bhopala and Karla.	4,932
	Leafy vegetables ..	2,837
5	Doubles beans ..	13,251 green pods.
		1,867 seeds dry.
6	Dudhia and Dodaka (Rabi).	11,767
	(*b*) Leafy vegetables.	4,603

Serial No.	Name of crop.	Outturn per acre in lbs.		Serial No.	Name of crop.	Outturn per acre in lbs.
		Grain.	Fodder.			
	Dry crops.				*Irrigated crops.*	
6	Linseed	662		7	Garlic	3,104
7	Nilwa for fodder		9,634 dry.	8	Lucerne (green fodder).	33,493
8	Shalu jowar	1,258 grain.	4,400 dry fodder 205 bhusa.	9	Oats and peas (green fodder).	23,216
				10	Onion (for bulbs)	24,621
				11	Onion (for seed)—	
					(*a*) Seed	372
9	Soya beans—				(*b*) Bulbs	1,556
	(*a*) Otootan (American black seeded).	1,875 grain.		12	Sugarcane—	
					(*a*) Plant cane POJ. 2878 and Co. 419.	12,720 (gul).
	(*b*) College farm (Yellow)	1,190 grain.	1,764 bhusa.		(*b*) Ratoon cane POJ. 2878.	14,196 (gul).
10	Tobacco (dry Jarda).	832			(*c*) Adsali (June planted) POJ. 2878.	11,928 (gul).
	(dust)	189				
11	Wheat (St. 808)	891 grain.	1,430 bhusa.	13	Suran (Final year crop from 10,964 lbs. seed corms each weighing 2·75 lbs.	64,228
					(*b*) 1st, 2nd and 3rd year all together.	19,098
				14	Sweet potatoes—	
					(*a*) Tubers	14,078
					(*b*) Green fodder	14,116
				15	Turmeric (green)	20,748
				16	Wheat (irrigated) Variety Pusa No. 4	1,562 grains. 1,783 chaff.

B. Research and Investigation.

6. *Relation of Humus to the use of Sulphate of Ammonia.*—The experiment has not given significant results for the last three years with three different crops of wheat, cotton and *Rabi* jowar. The experiment did not provide one crop under traetment for all the three years. The experiment is on very uneven soil and is to be dropped.

7. *Position of Legume and oil seed in rotation with a cereal.*—The treatments compared were (*a*) *Bajri* after *Bajri* (B B) (*b*) *Bajri* after *kulthi* (BK) (*c*) *Bajri* after sesamum (B Ses) (*d*) *Bajri* and Tur mixture year after year (BT).

These four treatments were started from 1934–35 and the results of four years are available :—

The results for *bajri* after *kulthi* and *bajri* after *bajri* are for eight years from 1931–32.

Taking the standard crop of the Deccan viz., *bajri* and tur mixture the other treatments are compared below for all the four years.

Treatments.

Year.	Grain yields per acre.			
	BT.	BK.	BSes.	BB.
	Lbs.	Lbs.	Lbs.	Lbs.
1935–36	845	*1,300	866	634
1936–37	460	914	622	598
1937–38	1,716	1,431	1,255	1,078
1938–39	949	1,020	904	645

*Bajri was taken after soya beans and not kulthi. The yield seems to be very high.

In 1936–37 the *Bajri* tur mixture suffered from scarcity of mositure.

In 1937–38 BT stood highest and was significantly superior to all other treatments and yielded more than BK by 16·5 per cent.

In 1938-39 BK and BT and B Ses are not significantly superior over one another but BB has been yielding significantly lower. Thus *Bajri* and tur mixture or B. after *kulthi* are equally good and B and T mixture stands first in money return over four years. B and Ses stands second and B and B stands third and B and K is the least profitable even though it comes second in yield as value of *kulthi* is very low.

8. *Manurial requirements of Brinjals.*—Study of the crop for the years 1933-34 to 1936-37, showed that nitrogen was the ruling element. Therefore in 1937-38, different quantities of nitrogen namely, 60 lbs., 80 lbs., and 100 lbs. per acre in the form of Sulphate of Ammonia in addition to 20 cart-loads of farm yard manure were compared.

The treatments of 1937-38 were repeated in 1938-39 on six replications. Applications of 60 lbs., 80 lbs. and 100 lbs. of nitrogen in the form of Sulphate of Ammonia in addition to 20 cart-loads of farm yard manure were in all cases significant over farm yard manure alone. But none of the doses of 60 lbs. 80 lbs, and 100 lbs. N. was significantly superior to the others when compared among themselves.

The table below gives the details of the differences in yield, cost of production and value of produce, in different treatments :—

Treatment.	Yield per acre in lbs.	Per cent. of increase in yield over control.	Cost of cultivation per acre.	Value of produce per acre deducting loss of 1·5 per cent. in sale.
			Rs. a. p.	Rs. a. p.
1. F. Y. M. 20 cartloads per acre (Control) ..	25,386	....	203 11 7	377 3 8
2. F. Y. M. 20 cartloads *plus* 60 lbs. N. as sulphate of ammonia per acre ..	37,573	48·0	236 3 4	560 12 1
3. F. Y. M. 20 cartloads per acre *plus* 80 lbs. N. as sulphate of ammonia ..	36,924	45·4	241 6 9	551 0 11
4. F. Y. M. 20 cartloads *plus* 100 lbs. N. as sulphate of ammonia per acre ..	39,822	56·8	250 12 7	594 5 1 at 66 lbs. per rupee.

9. *Effective rotting of Sann hemp green manure.*—Two experiments were started in 1937–38 to study effects of addition of farm yard manure at the time of ploughing in sann. The crops chosen were (*a*) Garlic and (*b*) Tobacco. The results of the year under report were as below :—

(*a*) *Garlic.*—(*i*) Sann plus farm yard manure is significant over the three other treatments.

(*ii*) Farm yard manure alone is significant over sann alone.

(*iii*) Sann alone, farm yard manure alone and sann plus farm yard manure are all significant over " no manure ".

The table below gives the details of the differences in yield, cost of production and value of produce.

Treatment.	Yield per acre in lbs.	Per cent. increase over control.	Per acre cost of cultivation.	Per acre value of produce.
			Rs. a. p.	Rs. a. p.
No manure ..	2,685	....	245 10 0	127 3 8
Sann green manuring only.	3,320	23·8	294 6 0	157 4 6
Sann *plus* farm yard manure 20 cart-loands per acre ..	4,080	51·9	324 6 0	193 5 4
Farm yard manure 20 cart-loads per acre ..	3,502	30·4	275 10 0	166 6 9

Remarks.—Two-thirds of the total produce was sold at 34 lbs. per rupee. These rates caused loss in cultivation.

Soil samples sent for analysis three weeks and six weeks after green manuring show quantities of nitrogen as under :—

Treatment.	Moisture after		Ammoniacal nitrogen in parts per million after		Nitric nitrogen in parts per million after	
	3 weeks.	6 weeks.	3 weeks.	6 weeks.	3 weeks.	6 weeks.
Sann alone ..	12·47	29·66	1·36	2·12	9·27	3·95
Do. ..	8·92	28·28	2·17	3·51	37·55	3·38
Sann *plus* farm yard manure ..	9·81	28·10	4·09	0·71	26·45	0·28
Do. ..	9·48	28·68	4·63	1·84	44·17	4·52

(*b*) *Tobacco.*—Like last year the experiment was not significant. The tobacco crop seemed to be not from selfed seed of Gandio No. 6. The following is the analysis of soil samples taken after three and six weeks after green manuring :—

Treatment.	Moisture after		Ammoniacal nitrogen in parts per million after		Nitric nitrogen in parts per million after	
	3 weeks.	6 weeks.	3 weeks.	6 weeks.	3 weeks.	6 weeks.
Sann alone ..	23·59	25·89	1·22	1·13	24·70	1·97
Do. ..	23·39	26·66	1·49	3·95	28·35	1·69
Sann *plus* farm yard manure ..	23·53	26·45	0·95	1·55	21·70	4·66
Do. ..	22·24	27·41	0·54	0·14	29·99	0·56

10. *Effect of different kinds of preparatory tillage with and without farm yard manure on dry crops in the Deccan.*—Two crops viz., Jarilla cotton and nilwa jowar for grain were taken in rotation. As far as cotton is concerned the manured plots give significantly higher yields over no manure due to accumulative effect of 5 cart-loads of farm yard manure every year over eight years as against no manure for so many years.

However, there is no significant difference between the ploughed and harrowed plots under manuring though the harrowed plot gives slightly higher yield. This shows that ploughing is not of any advantage.

In the case of jowar the difference in yield between manured and unmanured plots are not so high though the manured plots give significant high yield over no manuring. The yield of harrowed plots over ploughed plots with manures to both gives slightly higher yield but the increase is not significant. Here again ploughing has no advantage.

11. *Trial of Soya beans.*—A number of foreign varieties and local varieties of Soya beans were grown with the following results :—

Foreign varieties were early but very low in yield of grain except "Otootan" variety which yielded 1,375 lbs. per acre. The seed is black and like kulthi in size. It took 102 days to mature.

Some selected following Indian varieties yielded as under :—

Name of variety.	Number of days require.	Yield in lbs. per acre.
1. Brown No. 9	123	1,393
2. Small yellow	149	1,828
3. Black seeded	138	1,778
4. Large yellow	138	1,540

13. *Development of higher milk yield in cows and buffaloes along with early maturity and regular calving.*—The programme laid out in 1929 was continued.

A. *Sindhi cows.*—(*i*) The bull Tulip died on 3rd November 1937. His services could not be available during the year. There is no bull-calf from Tulip. Therefore Tulip blood cannot be continued. Information about out-crossing with Tulip bull will be discontinued from next year.

Only 3 out of 7 daughters of Tulip have shown superiority over their dams this year.

(*ii*) Daughters of the bull Silver Jubilee have not come into milking. Nothing can therefore be said of this at present.

(*iii*) In the line breeding policy, out of the 4 newly calved daughters, three were in milk, their performance is much below their dams. The statement given below gives the details.

Statement showing the performance of the cows in the Line Breeding Policy of King Canute.

Details.	Dams.	Daughter.	Dams.	Daughter.	Dams.	Daughter.
Name.	Riducan.	Riducanty.	Pivanir.	Perute.	Rahi.	Rahicanty.
Date of birth ..	21st August 1930.	15th April 1934.	23rd July 1931.	18th March 1935.	....	20th May 1935.
Date of first calving.	13th February 1933.	25th January 1937.	1st May 1934.	2nd December 1937.	Purchased cow, when 8 years old. Sold after one year to the Gowardhan Sanstha.	....
	Y. m. d.	Y. m. d.	Y. m. d.	Y. m. d.		Y. m. d.
Age at first calving.	2 5 22	2 9 10	2 9 8	2 9 14		2 7 24
Date of drying ..	15th January 1934.	31st August 1937.	9th February 1935.	17th December 1938.		12th August 1938.
Days in milk ..	336	218	284	380		271
Days dry ..	76	142	37	8		240
Milk during first lactation.	4,705½	2,679½	3,132½	2,842		2,039¾
Average yield per day of the milking period.	14·0	12·2	11·0	7·48		7·5
Average per day during first lactation (Calving to calving).	11·0	7·4	9·7	7·32		3·9
Progressive ..	3,803	2,602	3,560	2,674	5,393	2,038
	Y. m. d.	Y. m. d.	Y. m. d.	Y. m. d.	Y. m. d.	Y. m. d.
Annual average yield.	2 2 0	2 2 0	5 0 0	1 4 0	0 9 0	1 2 0

B. *Surti Buffaloes.*—(*i*) *In Breeding.*—There are two in-bred daughters of Bhagi in milk, namely Bhagtar No. 114 and Bhagtar No. 128. The following are their results :—

(*a*) Bhagtar No. 114 completed four lactations and calved for the fifth time on 20th January 1939. She has yielded 23,275 lbs. of milk during the four lactations as against 22,800 lbs. of her mother for the same number of lactations. During this period Bhagtar was dry for 329 days as against 138 days of her mother. The average yield per day for Bhatgar No. 114 is 12·3 lbs. as against 13·02 lbs. of her mother.

(*b*) *Bhagtar No.* 128.—The second daughter of Bhagi completed her first lactation and calved for the second time on 26th October 1938. She has yielded 5,275 lbs. of milk during her first lactation as against 7,401 lbs. of her mother for the same lactation period. During this period Bhagtar was dry for 113 days whereas her mother was continuously in milk. The average yield per day for Bhagtar No. 128 is 6·82 lbs. as against 12·2 lbs. of her mother.

Bhagtar No. 114 has come up to her mother so far, but the second daughter Bhagtar No. 128 is very much below her mother.

(*ii*) *Line Breeding.*—There were in all 16 buffaloes in milk, 5 from Bhagirathi line and 11 from Sajani line. The results on the whole show the lines to be superior to their dams.

C. Commercial working of the College Dairy.

14. The working of the year under report is summarised as below :—

Table No. I.

The performance of animals.

Year.	Cows.		Buffaloes.		Annual average yield per head.			
					Cows.		Buffaloes.	
	Milking.	Total (Dry and milking).	Milking.	Total (Dry and milking).	Actually drawn in lbs.	After feeding calves, lbs.	Actually drawn in lbs.	After feeing calves, lbs.
1937-38 ..	21·9	28·9	57·8	77·6	3,040	2,511	3,318	3,054
1938-39 ..	21·6	28·0	64·8	82·2	2,625	2,150	3,550	3,367

Table No. II.

The Financial aspect of the year 1938–39 *as compared with that of* 1937–38.

Year.	Total quantity of milk produced in lbs.	Milk fed to calves in lbs.	Milk available for disposal, lbs.	Cost of 100 lbs. of milk available for disposal.	Realisation per 100 lbs. of milk.
				Rs.	Rs.
1937–38 ..	345,557	37,550	308,007	15·48	12·10
1938–39 ..	351,386	28,413	322,973	15·70	13·10

The increase of Re. 0·22 in the cost of production is due to poor performance, which has increased the depreciation of the milking animals in general. The increase of Re. 1 in the realization is due to 3·2 more milk sold as fluid milk over the preceding year.

Table No. III.

Cost of production of milk during 1938–39 *on* 100 *lbs. basis as compared with that of* 1937–38.

Serial No.	Item.	Year.	
		1937–38.	1938–39.
		Rs.	Rs.
1	Maintenance of stock	8·38	9·09
2	Depreciation charges—		
	(*i*) Buildings and Dead-stock	0·96	0·67
	(*ii*) Live-stock	0·48	1·21
3	Milk delivery charges	1·25	1·27
4	Management charges—(1) Pay, (2) Travelling Allowance	3·33	2·50
5	Interest on Capital and Running	1·08	0·96
	Total ..	15·48	15·70

D. Aid and Assistance to the Public.

17. Help to different sections of the College.

The College farm provided 8 acres of land to different sections of the College and to the Agricultural Meteorologist for their research work. All other help was also given.

18. Individual cultivators and parties of cultivators from the different parts of the Bombay Province, visitors from the U. S. A. France, China, Burma, Ceylon, and the Indian States, formed the visitors to the Agricultural College Farm and the Dairy.

H. E. The Governor of Bombay, H. E. the Nawab of Cambay, the Honourable Mr. Morarji Desai, Minister for Agriculture, The Director of Agriculture, Sindh, The Imperial Agriculturist, The Imperial Animal Husbandry Expert, the Imperial Dairy Expert were among the prominent visitors.

18A. *Enquiries.*—Enquiries on all kinds of subjects, relating to different aspects of crop-growing, supply of seed, Dairying and Animal Husbandry, were supplied with the required information and seeds.

19. *Bull Services.*—The College Dairy afforded during the year under report, services of bulls to 40 cows and 15 buffaloes belonging to the public.

B. S. PATEL,
Professor of Agriculture.

Programme of work for the year 1939-40.

I. *Teaching.*—In addition to the University Syllabus, Practical Agricultural work to the three classes of the College has been added by providing the study of the management of the economic compact blocks by the B.Sc., class and actual work for the B.Sc. and F.Sc. classes on the farm and the Dairy.

II. *Research.*—The items of work to be continued during the year are :—

(*i*) Rotation of legume and oil seed in rotation with cereal.

(*ii*) Manurial requirements of Brinjals.

(*iii*) Effective rotting of sann hemp green manure.

(*iv*) Effects of different kinds of preparatory tillage with and without farm yard manure for dry crops in the Deccan.

(*v*) Trial of Soya bean varieties.

(*vi*) Development of higher milk yield in cows and buffaloes along with early maturity and regular calving.

(*vii*) Onionised *vs.* non-onionised water to cabbages.

Additions to the last year's programme.

(*i*) New *vs.* standard method of planting sugarcane.

(*ii*) Trial of Napier grass on " Mal land ".

B. S. PATEL,
Professor of Agriculture.

APPENDIX H.

Summary of work done under the Agricultural Chemist to the Government of Bombay, Poona, for the year 1938–39.

Dr. J. A. Daji held charge of the office and laboratories of the Agricultural Chemist throughout the year. Mr. N. Narayana, Assistant Professor of Chemistry, went on leave for 15 days from 26th October to 9th November 1938 during which period the charge of the post of the Assistant Professor of Chemistry was held by me. Mr. D. M. Ranade, Senior Assistant, was on leave on medical certificate for 27 days from 5th May to 31st May 1939.

Teaching.—The teaching of Chemistry to the students of the Poona Agricultural College forms one of the major duties of the staff of the Chemistry Section. The Assistant Professor and Lecturer bore the main brunt of this work. The teaching of Soils to the students of the Forest Rangers Course was also entrusted to this Section.

There were five post graduate students working during the year under report. One of them submitted a thesis for the M.Sc. of Bombay University and was declared successful. One student joined the laboratory for special work in analytical Chemistry.

Analytical and Advisory.—The total number of samples received for analysis was 673 out of which 641 samples were received from departmental farms and other Government departments and the rest from the public. The nature and number of different types of samples received for analysis is as under :—

Type of sample.	Government samples.	Private samples.
Soils	316	2
Waters	14	5
Manures	35	18
Dairy products	4	1
Foods and feeding stuffs	32	2
Seeds and grains	21	1
Gul	0	3
Miscellaneous	219	0
Total ..	641	32

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The Agricultural Meteorologist, Poona, sent one hundred and thirty-three soil samples in connection with an experiment on seasonal fluctuations in soil nitrogen. Forty-eight soil samples were received from the Professor of Agriculture, Poona, in connection with a rotational experiment carried on by him at the College Farm. Twenty-four more soil samples were received from the same officer in connection with a green manuring experiment. A similar experiment is being carried on at Surat and Jalgaon Farms; twenty-one samples were received from Surat Farm and four from Jalgaon Farm for analysis in this connection. Twelve samples of soil were sent by the Tobacco Breeder Nipani, in order to ascertain the relation between the quality of tobacco and the nature of soil conditions. The Cotton Technologist, Dharwar, sent 17 samples in connection with some of his cotton studies.

Among the manures analysed a sample of potash sent from Iran as having been mined in that country was found on analysis to be consisting mainly of calcium sulphate. A sample of Don river water sent by the District Agricultural Overseer, Bijapur, and which was meant to be used for irrigation, was found to be heavily impregnated with salts.

The dairy products included four samples of *ghee*, two from Mehmadabad and two from Poona. On analysis they confirmed the findings of the previous year that in one and the same tin the upper liquid *ghee* contains more of the characteristic *ghee* fats than the lower solid *ghee* which usually settles at the bottom of the tin.

Four samples of wheat grain obtained from the Bijapur market were analysed for the Imperial Council of Agricultural Research in continuation of a similar set of samples analysed last year to know the seasonal fluctuation in moisture content. The Live-stock Expert to Government of Bombay, Poona, sent five samples of grass from his Sheep Breeding Farm, Poona, to ascertain its feeding value at different periods of the year. Five samples of maize grain of different varieties evolved at the Dohad farm were analysed for the Superintendent, Dohad Farm, for their feeding value. The Superintendent, Kopargaon Farm, sent three samples of groundnut to determine their oil content. Three samples of *bajri* and four of castor seed evolved at Nadiad Farm were analysed for the Tobacco Breeder, Nadiad. The Cotton Breeder, Jalgaon, sent eleven samples of groundnut kernel to determine their oil content. Seven samples of various foodstuffs were analysed for the Manager, Agricultural College Dairy, Kirkee.

Three samples of *gul*, two prepared from date palm juice and one from cocoanut sap, were analysed for the All India Village Industries Association.

Amongst miscellaneous samples 116 samples of culture solutions were analysed for the Plant Pathologist to Government of Bombay, Poona, in connection with a joint study on the fixation of nitrogen by rice plants. Two samples of proprietary insectisides sent by the Professor of Entomology were analysed. One of them was found to be

nothing else but magnesium sulphate and the other a mixture of calcium carbonate and a borate together with some oil of wintergreen. Two samples of wool were analysed for the Live-stock Expert, Poona, and two samples of etiolated rice seedlings for the District Agricultural Overseer, Bassein. It was found that the etiolated rice seedlings were deficient in manganese. Two samples of *Kodra* (Paspalum scrobiculatum) grain and hay sent by the Veterinary Investigation Officer, Bombay, were found to be free from cyanogenetic glucosides. The hay was reported to be toxic to cattle. Twenty-seven samples of tobacco decoctions preserved with different preservatives were analysed for the Professor of Entomology to determine their nicotine content. Sixteen samples of tobacco were received from Tobacco Breeder. Nadiad, and twenty-four from Tobacco Breeder, Nipani, to determine their quality.

One hundred and ninety-eight inquiries were received during the year under report which were all attended to.

Research.—The results of the study of the changes taking place during the ripening of fruits were submitted in the form of a thesis by one of the post-graduate students to the Bombay University for which he obtained the M.Sc. degree.

As a side issue of this study the use of zinc oxide as a clarifying agent in the estimation of sugars was investigated. It was found that the results obtained with zinc oxide compared very favourably with those obtained with the usual reagent viz., basic lead acetate. In this respect zinc oxide being insoluble possesses a distinct advantage over basic lead acetate, as there is no need to remove excess of the clarifying agent as it is in the case of lead acetate.

The investigation into the intake of nutrients by crops was continued during the year. Two more crops maize and French beans were taken up for study this year. In both cases the rate of intake of nutrients was highest between the flowering and the seed formation stages. In maize, calcium and magnesium continued to be absorbed till the harvesting time. The absorption of phosphoric acid, potash, and nitrogen, however, decreased after the flowering stage. In the case of French beans there was a decrease in the nutrient contents at the mature stage indicating that there was possibly a partial return of the nutrients to the soil.

The work on the proteins of *bajri* (Pennisetum typhoideum) was written up and sent for publication.

The study of the physico-chemical properties of soil types could not make much progress due to the other activities of the workers. Five more profiles were collected from places having different climatic conditions.

The use of molasses as a fertiliser and its effect on soil fertility was tried by way of laboratory experiments. Three different types of soils

were each mixed with 5 per cent. of their weight of molasses and incubated under suitable conditions for a period of seventy days. The ammoniacal and total nitrogen contents of the treated soils were higher than those of the control throughout the period of incubation. The nitric nitrogen content was however, decidedly less than that of the control indicating that the addition of molasses had checked the processes of nitrification. The carbon : nitrogen ratio was still wide at the end of seventy days.

A new investigation into the available plant nutrients of the soils of the Bombay Province was taken up. Attempts are being made in the first instance to try the existing methods of determining available nutrients in soil with a view to find out one which is best suited to Indian soils.

The study of the fixation of nitrogen in rice soils in collaboration with the Plant Pathology Section was concluded. The findings of previous workers from this section that rice soil contained more nitrogen and that the presence of the growing roots of rice plants helped the nitrogen fixing power of the soil were confirmed. As a result of the present study it was shown that the fixation of nitrogen was due to an *Azotobacter* present in the soil. The activity of the *Azotobacter* was increased considerably when the organism was associated with the growing roots of rice seedlings. This increase in activity of the organisms was due to a change in reaction brought about by the living roots.

General.—A demonstration for the preparation of essential oils from orange and lemon peel was held for about a week at the time of the fruit canning and preserving class held at Bijapur. Exhibits were lent for show at the Industrial Exhibition at Poona and at the Khadi and Village Industries exhibition at Tripuri.

At attempt was made to prepare syrup from *mowhra* (Bassia latifolia) flowers. The dry flowers contain more than 60 per cent. of sugars of which nearly 80 per cent. is in the form of reducing sugars which are not crystallisable. The flowers were extracted with water and the extract concentrated to syrup. A number of syrups were prepared in this way having 70° Brix. and containing 60 per cent. total sugar. Though the syrups thus prepared possess a good taste and keep well they develop a dark brown colour which makes them rather unattractive. Several attempts made to improve their colour have proved unsuccessful so far.

In view of some inquiries received as regards the difficulty of preparing solid crystalline *gul* from *nira* or unfermented date-palm juice a few trials were taken on a semi-large scale. The trials were highly successful and no difficulties were encountered in getting good solid *gul.*

There were no cases of corruption in my section during the year under report.

Publications.—The following papers were published during the year :—

1. The proteins of *bajri* ; by V. S. Abhyankar and N. Narayana ; Proc. Ind. Acad. Sci. (1939), 9, 126—132.

Bajri (Pennisetum typhoideum) contains about two-fifths of its protein as prolamin and one-fifth as a globulin. The rest of the protein can be slowly peptised out by dilute alkalies. The globulin can be fractionated into two portions by differential coagulation—a small part A coagulating at 43°—45° C and a large part B coagulating at 83°—85° C.

The proteins were analysed by Van Slyke method. The prolamin is tolerably rich in tryptophane and cystine. The arginine content of globulin A is nearly half that of globulin B, but the latter is very rich in histidine.

2. A note on the sampling of *ghee* ; by J. A. Daji ; Poona Agric. Coll. Mag. (1939), 30, 141—142.

The necessity of taking representative samples of products like *ghee* is pointed out.

Programme of work for 1939-40.

I.—Studies to be continued from the previous year—

1. The physico-chemical properties of soil types.
2. The intake of nutrients by plants.
3. Available plant nutrients of soils.

II.—New items for study—

1. Investigations into the photo-chemical theory of nitrogen fixation in soils.

J. A. DAJI,

Agricultural Chemist to Government,
Bombay, Poona.

APPENDIX I.

Summary of Work done under the Economic Botanist to the Government of Bombay, Poona, for the year 1938–39.

Professor L. S. S. Kumar held charge of the section throughout the year under report except for one month from April 22nd to May 21st 1939 when he was on leave on average pay. Mr. V. M. Chavan officiated as Economic Botanist during the absence of Professor L. S. S. Kumar on leave. Professor Chavan officiated in addition to carrying out his duties of the Assistant Professor of Botany.

Mr. S. R. Godbole and Mr. W. V. Joshi continued to work as Assistant Economic Botanist and Demonstrator in Botany respectively.

The following new appointments were made during the year. Mr. S. Solomon was appointed the Striga Investigator with effect from 27th January 1939. Mr. D. S. Ranga Rao was appointed the Linseed and Oil Seeds Breeder under the schemes financed by Sir Sassoon David Trust Funds with effect from 15th April 1939, in place of Mr. R. D. Gaitonde who was transferred to a post under the Horticulturist to the Government of Bombay, Poona.

Teaching.

The Economic Botanist was assisted by the Assistant Professor of Botany and Demonstrator in Botany in carrying out the teaching work satisfactorily. The Assistant Economic Botanist took classes in systematic botany for the Forestry students.

The section arranged for a demonstration lecture for the Civilian class.

Batches of students of Colleges from outside the Province, visitors to the College and students of the local schools and Colleges were shown round the section and the work in progress was explained to them.

Four new students were admitted for post-graduate studies in cytology and genetics. There are in all six students engaged in post-graduate studies.

Grass Research.

Grazing Experiment.—The large scale rotational grazing experiment at Mangdara *kuran* was continued during the year. The experiment commenced on 17th August 1938 and ended on 28th February 1939. The season was highly satisfactory and sufficient grass was available to the cattle up to the conclusion of the experiment.

The yield from representative quadrats randomised in each block showed decided increase particularly in blocks 3 and 4.

Study of Andropogon contortus.—Mapping of the areas occupied by spear grass (*Andropogon contortus*) has confirmed the previous observations that the effect of grazing is that the spear grass is being replaced by better species of grasses.

Effect of different treatment on Aristida funiculata.—Three large quadrats hundred feet in square occupied by a fine stand of *Aristida funiculata* were treated differently. The quadrat in which the soil was stirred has shown marked change in the vegetation as compared with the burnt and untreated quadrats. Stirring of soil has evidently encouraged the growth of many non-grass species.

Acclamatization of Australian grasses.—Seeds of six types of grasses that were successfully grown were sent for trial to the farms under the Livestock Expert to the Government of Bombay, Poona, but owing to very heavy rains the grasses failed to respond satisfactorily. Fresh trials will be taken up again.

Striga Research.

Since 27th May 1938 the scheme for Investigation into the attack of *Striga* on *Jowar* is being financed by the Imperial Council of Agricultural Research. The staff under the scheme was appointed with effect from 27th January 1939.

Selection of *Striga*-resistant *jowars* from the varieties "bilichigan" and "muddinandyal" was continued during the year under report. Selections made the previous year from these two varieties gave 90 per cent. resistant plants. Seed of 101 resistant plants from "bilichigan" and 29 from "muddinandyal" variety have been harvested for further selection work.

In the experiment for selection of resistant plants, four varieties of *jowars* from Central Provinces, two from Madras and two from Sind have been included for the first time. Few resistant plants obtained from some of these varieties late in the year failed to set seed. A few, however, have proved resistant to *Striga lutea* in the field and are, therefore, promising.

Longevity test of *Striga lutea* seeds started in 1935 appears now to be complete. Success has been obtained in germinating *Striga densiflora* seeds in the laboratory for the first time. It has been found to germinate in contact with the host only in darkness. This knowledge will aid in selecting plants resistant to *Striga densiflora*. The seeds of the three species of *Striga* respond differently to influence of light and darkness. *Striga densiflora* germinates only in darkness, *Striga lutea* readily germinates in light but increased germination results in darkness and *Striga euphrasioides* germinates only in light.

Linseed Breeding Scheme.

This report relates to the first year of the extension of the scheme. Breeding work on linseed was continued at Poona and district trials of eighteen selections, six for each centre, viz., Deccan, Khandesh and Karnatak, were conducted at Madha in Sholapur district, Pimpalgaon in Nasik district and Bijapur respectively. The lay-out was according to Fisher's Latin Square method, replicated seven times.

Four out of the six strains tried atMadha proved significantly superior to local while the remaining two gave increased mean yield over the local though not significant. Pimpalgaon trial showed that five selections gave higher mean yield over the local but the results were not significant. The trial at Bijapur was entirely vitiated on account of water logging of the plot and consequent poor germination of the seed. A trial of the above eighteen selections at Poona with the same local checks as were used in the districts was vitiated on account of the unsuitable nature of the soil and shading effect of road side trees adjoining the trial plot. It is proposed to repeat these trials on better soil during 1939–40.

Hybridisation work between promising selections and C. P. White and Pusa L. T. 6 were carried out. In all cases reciprocal crosses have been made and the F_1 progeny will be grown and studied during the *rabi* season of 1939–40.

Extra Provincial pure types were maintained. Most of them with the exception of C. P. White chosen for crossing show a reduction in oil percentage and iodine value. The iodine value has however not fallen below the trade requirements. Studies on root system and developmental stages of the capsule are in progress.

Oil Seeds Breeding Scheme.

The report relates to first year's work. Safflower, niger and sesamum are the three crops under trial for improvement of yield and oil content.

A number of selections in safflower for higher yield and higher oil percentage have been made from district samples received from all over the Province. The highest oil percentage so far obtained after only one year's selection is 39·1 per cent. while the fluctuation of the mass material is between 30 to 35 per cent.

Since the scheme started in September 1938, it was too late to take a crop of sesamum which is a *kharif* crop. However a trial crop sown in the *rabi* season did not grow successfully.

In niger oil percentage varies from 31·3 to 43·0 per cent. Selection of types for higher yield and higher oil content is under way.

Orobanche Research.

For want of adequate facilities it has not been possible to make much progress in this investigation. Since plants have to be cultured on a limited scale it has not been possible to select a type of tobacco plant carrying a high degree of resistance to *Orobanche*. It is now proposed to make a collection, from different countries, of seeds of "Harrison Special" and also of other desirable species of tobacco and make crosses if necessary to evolve resistant types.

Forty-nine resistant plants have been selected from 300 plants culture. The variety G. 6 failed to set seed owing to delay in sowing the seeds.

Miscellaneous Experiments.

Bajri trial.—This experiment was conducted to determine the conditions under which the African *bajri* will give better yield than the local. Previous years experiments indicated thatthe time of sowing and spacing were determining factors in regard to the higher yield of the African variety. Sowing a month earlier and spacing it twelve inches apart within the row and eighteen inches apart between the rows gave significantly better yield.

Electro-culture through onion.—Dr. Nehru's claim that onionised water has beneficial effect was sought to be tested by a scientific experiment. The onionised water was supplied to wheat and gram planted in the ground as well as in pots. Control plants were given ordinary water The experiment has shown that no benefit is obtained by growing plants from onionised water. This experiment will be repeated for another season.

White flowered groundnut.—Crosses made between the white (mutant) and yellow (normal) flowered varieties failed to succeed. Fresh crosses have been made and the F_1 progeny will be grown for study of inheritance of petal colour.

Inter-generic cross.—Selections of a few vigorous fodder types from the *Euchlaena* × *Zea* cross have been made and are under trial. The study of the botanical characters of the parents and their progeny in the different generations have been completed. The work is being summarised for publication.

Inheritance studies in Chillies.—The F_1 and F_2 generation of the cross between type 60-2 and superfine round were studied in detail for several characters. Selections from the F_2 will be carried forward for further studies.

Studies in Phaseolus species.—Botanical and cytological studies in the important cultivated and wild species of *Phaseolus* are in progress.

Inheritance studies in Castor.—Four pure lines of annual castor have been maintained for several years. Crosses between these pure lines are under study for inheritance of different characters including heterosis.

Selection in Udid (Black gram).—District samples from all over the Province were collected and breeding work for selection of superior type was begun. The material showed considerable variations. Selections made have been preserved for future use.

Classification of Tur and Groundnut.—The data is being compiled for publication.

Weed-killing experiment.—Sodiumchlorate was used in a randomised method for killing weeds in a *bajri* plot. Cent. per cent. kill was recorded in non-grass weeds with a two and a half per cent. solution. Grasses were affected only to the extent of about sixteen per cent.

Seed Testing.

Longevity tests of grasses and vegetables seeds continues. The grasses gave poor germination in the beginning and later gave better germination which is still being maintained.

117 samples of seeds received were tested for germination percentage and were reported on. The number of samples tested in previous year was 102.

Miscellaneous.

Herbarium.—Collection of specimens to replace old and worn-out ones is being made whenever possible. 287 plant specimens were identified during the year as against 178 in the previous year.

Economic enquiries.—81 enquiries some involving lengthy explanation were attended to promptly. In the previous year 94 enquiries were received.

A large collection of seeds of grasses and plants of economic importance were supplied for introduction and experimental purposes to Russia, Aden and Australia.

Establishment.

There has been no case of corruption on the part of the subordinates in this section during the year 1938–39.

		Publication.
Kumar, L. S. S.	..	A new phanerogamic parasite of *Andropogon Sorghum*. Current Sci., Vol. 7, No. 1, July 1938.
Godbole, S. R.	..	Some poisonous plants of the Bombay Province (in Marathi). Part I, Shetki and Shetkari, September 1938.
		Some poisonous plants of the Bombay Province (in Marathi). Part II. Shetki and Shetkari, May 1939.
Joshi, W. V.		Variations in the structural details of some Xerophytes of Matheran. Poona Agricultural College Magazine, Volume 30, No. 3, December 1938.
		Factors of the Habitat and their effect on vegetation. I. Shetki and Shetkari, June 1938.
		Factors of the Habitat and their effect on vegetation. II. Shetki and Shetkari, August 1938.
		Factors of the Habitat and their effect on vegetation. III. Shetki and Shetkari, November 1938.
		Factors of the Habitat and their effect on vegetation. IV. Shetki and Shetkari, February 1939.

Agricultural College,
Poona, 4th September 1939.

L. S. S. KUMAR,
Economic Botanist to Government,
Bombay.

Abstract of papers published in 1938-39.

1. A new phanerogamic parasite of *Andropogon Sorghum*.—L. S. S. Kumar.

   Describes the attack of *Sopubia delphinifolia* on *Andropogon sorghum* (*jowar*) and publishes photographs showing the root connections between the host and the parasitic flowering plant.

2. Some poisonous plants of the Bombay Province (in Marathi), Parts I and II.—S. R. Godbole.

   Describes the recognisable characteristics of the different poisonous plants and the effects they produce.

3. Variations in structural details of some Xerophytes of Matheran. —W. V. Joshi.

   Describes the characteristic modifications of some Xerophytes of Matheran and discusses the relations of these to the environment.

4. Factors of the Habitat and their effects on vegetation (in Marathi), Parts I, II, III and IV.—W. V. Joshi.

   Discusses how each of the factors of the habitat separately affects the vegetation.

L. S. S. KUMAR,

Economic Botanist to Government,
Bombay.

Programme of work under the Economic Botanist to the Government of Bombay, Poona, for the year 1939–40.

(1) *Grass Experiment.*—The rotational grazing experiment at Mangdara *kuran* will be continued. Trial of acclamatized Australian grasses will be carried out.

(2) *Striga on Jowar.*—Selection of resistant *jowars* will be continued. The work on technical programme approved by the Imperial Council of Agricultural Research will be commenced as soon as the Striga Investigator is appointed.

(3) *Orobanche on Tobacco.*—Selection of resistant plants will be continued by growing the cultures on large scale as in previous year.

(4) *Linseed Breeding.*—Hybridization work between selections from Provincial material and non-provincial types for introducing white colour of seed will be undertaken.

(5) *Oil Seeds Breeding.*—Selection of superior types from safflower, niger and sesamum will be continued.

(6) *Seed Testing.*—The work on longevity of grass and vegetables seeds will be continued.

(7) *Inheritance studies.*—Studies of inheritance of characters in chilli, castor and linkage studies in cotton will be continued.

L. S. S. KUMAR,

AGRICULTURAL COLLEGE :
Poona, 4th September 1939.

Economic Botanist to Government,
Bombay.

APPENDIX J.

Summary of work done under the Crop Botanist to the Government of Bombay, Karjat (Kolaba), for the year 1938-39.

Administration.

During the year under report Mr. B. S. Kadam held the charge till 4th August, when he sailed to America on leave on half average pay. I held the charge from that date. Mr. V. K. Patankar who worked as Superintendent, Niphad Farm from 16th June, was on leave for one month and one week, when Mr. S. M. Patel worked as Superintendent, Cereal Breeding Station, Niphad. Mr. M. V. Gadkari took the charge of Superintendent, Karjat, from 6th June.

Rice Breeding.

Selection material.

(1) *Selection in Zinya.*—Out of the selections referred to in the last year's report, four promising ones from yield point are maintained. There is no significant difference, however, all the selections though longer and finer than Local, have yielded lower than Zinya Local, Z. 149 is equal in length to Local though lower in yield this season. Thus fresh samples from a wide tract have been collected for further selection.

(2) *Bhadas.*—Eleven selections from the second lot and two from the first lot, were compared in two separate replications with Local (Mahad) for the first time, none of the selections is significantly superior to Mahad Local, which was however impure. In all, ten selections are maintained. It may be noted that Alibag Bhadas is rather later than other Bhadas while that from Roha is earlier. Few samples have been collected for further selection.

(3) *Selection in Kada.*—The selection 100-4 Red Kernelled was compared with Local Kada (which had 27·5 per cent. red kernelled) by A. B. B. A. method; the difference is not significant, but 100-4 has yielded lower than Local by 5·2 per cent. The selections from the second lot were compared with Local. There was no significant difference and none of the selections is superior in yield. Six are maintained. Thus fresh samples have been collected for further selection. It requires to be noted that none of the samples is pure red, one from Umbergaon had 68 per cent. red kernelled. The samples from Bansada State were of pure deep amber colour; while the mixture white of Umbergaon was of lighter white than from any other place; this variety can be substituted by K. 79 or K. 184.

(4) *Selection in Jirbuti.*—Three selections from the first lot and four from the second lot were compared with Local Jirbuti. Selection 86-6 is significantly superior to Local, which was only slightly superior last year; the Type 61-2 which yielded the best last year has yielded the lowest this year like 81-8 and these are left out; five are retained.

(5) *Selection in Mahadi.*—The selection M. 2-2-35, an off-type plant with medium awns from Ratnagiri Bhadas was compared with Bhisegaon Mahadi in A. B. B. A. method. The difference in yield is not significant. It has yielded little less than Local. Besides it has never been tested on the appropriate land. It is decided to make fresh selection and to continue this selection in the unit selection area.

(6) *Selection in other varieties ouside Konkan.*—The selection was started in Sathi from Nandurbar (West Khandesh), in Sutarsal from Thasra and in Bangalya from Bulsar in 1936, on a small scale. The Local Sutarsal sample from Godhra was early with poor tillering and hence was left out. Bangalya seems to be superior in yield. Some selections from it are promising, which are continued. Fresh selection is started in Sutarsal. In Sutarsal, which is extensively grown, fresh samples are collected for further selection, though K-184 can replace this variety. Selection in Wankwel is started and it appears there are marked differences in yield of different Locals.

Fresh selection.—With a view to have Kolamba selection, flowering between K-184 and K-501 fresh selection is done from Local early Kolamba of Palghar. Pankhali variety has been found to be a low yielder and selection is started as also in Jiresal. Selection from long grain fine Local varieties, viz., Dangarbhat, Utavli, and Moraya-late, is also started. The local Sukhwel shows large variations; similarly selection is done in very early Dhudani variety. Fresh samples have also been collected for selection in Pattya, Tavsal, Ghosalwel and Halwa grown extensively in the tract.

(7) *Selections from scented varieties*—(*a*) *Long grained Kamod*—Selections from Kamod of Kaira and of Nasik were compared with Pankhali; the promising four are maintained. Nasik selections are coarser while the one from Kaira is longer and Pankhali has no smell. These will be compared next year with Nasik Kamod and Chimansal.

The late selections were compared; two selections true to type but without scent are maintained for high yield and will be compared with Pimpalner Kamod and Raybhog next year.

Chimansal and *Raybhog.*—Five selections from Chimansal will be compared a fresh with typical local. Two selections from Raybhog true to type are maintained for further test; none of the selections has scent, hence selection will be done from fresh samples.

(*b*) *Short grained varieties; Ambemohor and Jirwel.*—Selections from Ambemohor were found to be impure. The promising selections from

Ambemohor and Jirwel are maintained ; Jirwel No. 12 is promising and is scented.

Synthetic Material.

(1) K-42 × *Krishnasal* F. 8.—The cultures had no scent and were inferior in yield to K-540, hence the cross is rejected.

(2) K-226 × B-52 F.8—Twelve individual Bhadas like selections from bulk of last year were compared with I-B-12-11. Eight best ones are maintained for comparison with I-B-12-11 and Mahad Bhadas. There is no significant difference.

(3) *K*-42 × *K*-414 *F*.7.—Three cultures were compared with K-42 and K-226 ; K-42 yields the best ; K-226 is significantly inferior to all. The culture 15-5 was significantly inferior to other cultures and hence is rejected. Thus the two remaining cultures will be compared with K-42. These are superior in grain length and breadth to K-42.

(4) *K*-39 × *K*-164 *F*. 15, *K*-501.—The yield results are not strictly comparable, owing to several reasons, hence the experiment will be repeated.

(5*a*) *P*-6 × *K*-79 *F*.8.—Patni-515 was compared with Kada Local, K-79 and Patni-6 for the third time. The results are not significant. However Kada Local has yielded better than Patni-515 as in the previous two years. Next season Patni-515 in two derivatives and K-184 will be compared with Dangi and early Kolamba as Locals, as Patni-6 is grown on Ratnagiri side only.

(5*b*) *P*-6 × *K*-79 *F*.8.—*Kolamba like grains.*—Selections made from bulk were tested in lines last year and this year three derivatives of 229-11 and one from 917 were compared against K-79 in replications. The results are not significant. No. 917 yielded the lowest and is left out. The three derivatives have also lower moth attack than K-79.

Ten more similar selections were compared with K-79. The results were significant. Nos. 13 and 19 which were significantly superior to the general mean are maintained for trial. No. 13 however had more attack of moth.

(6) *K*-184 × K-79 *F*.6.—The yield results are not significant. It is maintained for further test.

K-226 × *S. Ghosalwel F.* 6 *and K*.226 × *Coimbatore F.* 4.—These were tested together and the results were significant. They are promising except that the former requires further purification while both appear to be more attacked by moth.

K-226 × *Z*.242 *F.* 4 *and K*.226 × *Sukhadashi F.* 4.—Sixteen cultures from the first cross were tested in replications for the first time in comparison with K-226 and Z. 149. The results were significant. Eight are maintained.

K-226 × *Sukhadashi F.* 4.—Out of one family of F. 3 there were three pure scented progeny rows from which fourteen plants are retained. Out of the bulk F. 4, two scented plants are retained in addition. Out of these sixteen, nine will be tested for the first time in replications.

(8) *F.* 3 *crosses*—(*a*) *Jirbuti* 61-2 × *Burma*, (*b*) *K*-540 × *Z*.149, (*c*) *K*-79 *virescent white* × *Pankhali*, (*d*) *Kamod virescent white* × *K*-401 *virescent yellow and* (*e*) *K*-540-56 × *K*-540 *Hooked.*—(*a*) Jirbuti cross, the plants flowering within 106 days with high yield and less shedding are maintained. (*b*) 20 plants with medium flowering habit and thirty of late flowering habit are retained. (*c*) It is rejected. (*d*) The plants from two families 401-11 and 13, flowering within less than 110 days, are only retained, even though they have no scent. (*e*) Thirty selections flowering between 109 and 117 days with normal grain shape and sterility but short in length are retained.

Agronomic Experiments.

The necessity of rabbing was tested since last three seasons. In all the three seasons, the yields are significantly high ; however looking to the present price, the increased value will not pay the actual cost of rabbing which the peasants have not to suffer.

Yield Trials in the District.

(1) *North Central Division.*—A trial was taken with P.515 *vs.* Dangi, Local Patni and Dodki ; Patni-515 was the earliest and its grain quality was considered inferior to that of Local Patni. It is not suitable for Thana.

Bhadas.—Trials of Bhadas are postponed till a higher yielding strain is discovered, the present selection being not found to be superior.

In Palghar Taluka, Z. 149 yielded 11·5 per cent. higher than Surti Zinya in one trial and in the other, only a little higher.

(2) *South Central Division—K*-540 vs. *Jirwel and Raybhog.*—K-540 was earlier and yielded about 18 and 14 per cent. more than Jirwel and Raybhog respectively. The price of K-540 is however lower.

K-501 vs. *Jirwel and Varangal.*—K-501 was earlier than Jirwel but was similar in flowering to Varangal. K-501 yielded better by 15·7 and 17·5 per cent. respectively. Thus K-501 may be a profitable substitute for Varangal as Jirwel fetches much better price. All these trials were conducted by the Taluka Development Association, Akola (Nagar).

(3) *Gujarat.*—K-79 was tried by Taluka Development Association, Chorashi, in Jowar crop. The cultivator was not satisfied with the yeild.

K-184 vs. *Kada.*—Trials were taken by the District Agricultural Overseer, Bulsar, at Damdachi (Bulsar). K-184 yielded 2,035 lbs. against 1,360 lbs. of Kada. He also reports that the percentage of whole rice from K-226 is lower than that of Nawabi Kolam.

Multiplication and Distribution of Seed.

The total quantity of seed distributed was 1,686 lbs. There was a demand mainly of early varieties from Gujarat, thus K-501, K-184 and Patni-515 were given for Gujarat. The seeds of K-42, K-540, K-501 and Z.149 were given to the District Agricultural Overseers, Konkan. A small quantity of K-501 and K-540 was sent to Nagar. The seed multiplication of about 5 acres is now in my charge and it is planned to crop nearly half the area under K-42 and the remaining area with K-226, K-540 and Z.149.

Bajri Breeding.

1. The improved bagging technique referred to in the last year's report was followed this season and its efficiency will be noted in 1939–40 season. An attempt to maintain purity of selections by growing in an off-season was made; the grain setting was very poor and no crop could be received.

2. The evil effects of in-breeding for a few years are not regained by group breeding. It is found that F. 1 crosses give higher yield, this may be due to heterosis. Fresh mass selection is started in different locals for improving yield.

3. *Yield trials of promising bulks.*—These were carried out in five separate replication series with selections from Local, from Akola and from the natural crosses of African Bajri; none of the selections is significantly superior to Local. However it may be noted that some cultures of selections 28–15, 187 and AK-297–6 yield better in some seasons, though the grain is smaller than that of Local.

Wheat Breeding.

Synthetic Material.

1. The selection B.G. 8–1 was compared for the fourth time with 808, 168 and Local. No. 808 is significantly lower in yield than all

while B.G.-8-1 has yielded the best. The average results per acre of last four years are as under :—

Variety.	Yield per acre.
B.G.-8-1	696
808	700
168	632
Local	647

Thus B.G.-8-1 stands second, as 808 yielded much better in 1936 a year of virulent rust attack. The quality of B.G.-8-1 as valued is also very good ; thus it is worth trial in the central part of Nasik district where 808 is not taken up. 808 was very much affected by smut this season.

2. The R.17–56–63 from Baxi 33 × K-K-568 and three late cultures of Baxi 33 × 808 were compared with Baxi 33 under irrigation. The results are not significant as last year ; The grain of 114–17 is better ; while the grains of R.17–56–63 and of 165–19 are long. These will be compared with Local Baxi next year as these cultures are to replace it.

3. Eight early derivatives of the cross Baxi 33 × 808 were compared with 808 and No. 224 by dibbling. The cultures 34–9 and 137–9 are dropped on account of low yield. As in the last year 31–20 and 31–29 have yielded the best. The test will be continued.

4. *Bansipalli* 809 × *Pusa* 4 *F*7.—Three cultures were compared with Pusa 4. The cultures 5–1–3–38–5 and 5–1–3–52–1 are significantly superior to Pusa 4. Last year also 5–1–1–3–38–5 yielded the best. The test will be continued.

5. *Bansipalli* 808 × *Polish F*5.—The promising selection from this cross and its back cross are continued for further selection.

6. *Trial of Pusa* 4, *Pusa* 165, *Baxi* 33 *and Mondhya*.—Pusa 4 and 165 were compared with local irrigated wheats Baxi 33 and Mondhya. Pusa 165 has yielded the lowest, even significantly to Baxi–33 and Mondhya ; Pusa 4 has also fared similarly in comparison with Mondhya. Pusa 165 has very good quality and this season was rust free and even though Mondhya has poor quality, it pays the cultivator in such a season.

7. *Sowing date experiment of wheat.*—The experiment referred to in paragraph 8 of the last year's report was repeated by drilling. Again

for the fourth season there is no significant difference due to sowing in different weeks. On an average of last three years' results, the yield by sowing on 29th of October is the highest, though there is no significant difference.

Black stem rust of wheat.—Vernal × Khapli 76 F_2 is continued. Fresh cross with Khapli 76 is also done. It was crossed with Pusa-4 and other types. The double cross of (808 × Viticulosum) with the above was also fertile on one plant and on this plant fresh crosses have been attempted. This material is prepared for testing rust resistance when rust scheme is launched.

District Trials.

Gujerat Division.—In Ankleswar Taluka, the wheat Nos. 224 and 808 were tried with Local with the results as under :—

Name of the strain.	Yield per acre.	Remarks.
224	448	Average yield of Local per acre = 400 lbs. The price per 40 lbs. of Local was Rs. 1-12-0 against Rs. 2 of the strains.
808	560	
808	461	

Multiplication of seed.

The standard strains 808, 168 and 224 were multiplied each on half an acre on the Farm for regular renewal of seed, on Jalgaon Farm; No. 808 was also multiplied on the leased out area and 600 lbs. of pure seed was distributed, 200 lbs. of seed of 168 and 240 of 224 seed was also distributed.

Gram Breeding.

Selection.

(1) *Yield trial.*—Four early and 12 late strains were compared with Local by dibbling. The strains 816 and 693 early and the late one 822 have yielded significantly higher than Local. The strain 816 has yielded the best in all the previous seasons. It yielded higher also on Jalgaon Farm. However its grain is not bigger than Shahada and Jalgaon gram, though it is bigger than Niphad Local. Thus it is worth distribution in the Local tract. The trials of 693, 816 and 822 will be continued.

(2) *Nipping of gram.*—The experiment referred to in paragraph 2 was repeated. This season nipping at flowering time is found significantly superior to the Local practice of nipping "after flowering". If the cultivators do not care for tender tips for vegetable after flowering, the increase in yield can be obtained, as is found in all the three seasons.

Breeding of minor crops.

(1) Val (Dolichus) Nine selections were compared with Local in a latin square, the crop again suffered badly from virus diseases and the results are vitiated.

(2) *Rala(Setaria Italica).*—Two selections were compared with Local. Selection No. 11, gave significantly lower yield than No. 4 and Local, hence it is left out. No. 4 yielded 6.8 per cent. higher which is not significant. It is similar in flowering toLocal hence it will be tested again next year.

(3) *Tur.—Cajanus Indicus.*—The culture T.24 was tested with Local. It is found to be splitting ; It yielded only 3 per cent. more. The trial will be repeated with the promising derivative 24-3.

Nine promising selections were compared on a small scale with one from Khandesh Local and the Niphad Local. It is to be noted that all white seeded selections including Khandesh No. 1 (which is very early) yielded low. No. 84 yielded the best like last year : Six promising selections will be compared next year with Local ; Out of these, three are late in flowering while one is early with bigger seeds.

(4) *Linseed.*—The experimental trial with six selections is again insignificant in yield. The work is continued as it is carried on by the Economic Botanist, Poona.

(5) *Sesamum.*—The observations on anthesis were carried out and the preliminary yield trials were taken.

Co-operative studies.

Agricultural Meteorological observations.—Precision experiment on rice was conducted during the year. The results are supplied to the Agricultural Meteorologist, Poona. A small observatory has been established, and the instruments have been loaned by the Agricultural Meteorologist, Poona.

Publications.

(1) Kadam, B. S., and Kulkarni, R. K., 1938.	Genetic improvement of wheat in Bombay 1 Bansipalli 808.

Agriculture and Live Stock in India Volume VIII, Part IV, July 1938.

A new wheat Bansipalli 808 is described. It is derived from a cross between Bansi 168 and K. K. 568. It is earlier by ten to fifteen days than Local Bansi. It is suitable for Nasik district, especially to the southern and eastern portions. It is little difficult to thresh.

(2) Kadam, B. S., and Kulkarni, R. K., 1938. — Genetic improvement of wheat in Bombay, 2. Bansi 168 and Bansi 224.

Agriculture and Live Stock in India, Volume VIII, Part VI, November 1938.

Two improved strains of wheat Bansi 168 and Bansi 224 derived by selection from local wheat, are described; the former is a standard strain in West Khandesh, while the latter is suitable for East Khandesh.

(3) Patankar, V. K., 1939 .. Improvement of Ratnagiri rices by breeding Part I.

Department of Agriculture, Bombay Presidency, Bulletin No. 181 of 1938.

The results of selections made in the early, midlate and late varieties of rice suitable for the northern part of Ratnagiri are given.

Patni 6 and Kudai 2 are recommended as rearly, Panwel 61 and Waksal 207, as mid-late and Bhadas 79 and Varangal 420 and 487 as late.

M. L. PATEL,

2nd August 1939. Crop Botanist.

Programme of work under the Crop Botanist to Government of Bombay-Karjat, for the year 1939–40.

Rice Breeding.

1. Replication yield tests will be carried out between selections from (*a*) Local varieties and (*b*) from varieties outside Konkan and (*c*) the cultures evolved from the crosses.

2. Fresh selection will be done (1) in the Local fine varieties namely (*a*) Zinya and Early Kolamba in (*b*) coarse early varieties, viz., Jirbuti, Ghosalwel, Halwar, Kada, Mahadi Bhadas, Patni and Dodki and in (*c*) the mid fine varieties, viz., Patya Varangal and Tavsal and (*ii*) Out side varieties, viz., Dodak, Sutarsal and Kolpi and (*iii*) the scented varieties, viz., Sakwar, Raybhog, Chimansal, Jirwel and Ambemohar collected from a large area.

3. Agronomic investigation as to the number of seedlings per bunch.

4. Multiplication of pure seed of strains for distribution.

Bajri Breeding.

1. Comparison of one and two years' open pollinated bulks of promising selections will be continued against Local.

2. Mass selection in early and late locals and in Akola selections will be continued.

Wheat Breeding.

1. Trial of new improved strain B.G.8-1 will be continued.

2. The comparison of promising culture 17-56-63 of Baxi palli cross will be continued.

3. Yield trial of Pusa 165 will be continued.

4. Yield trial of promising derivatives from Baxi 33 X 808, 809 X Pusa 4 and Polish X 808 will be continued and selection will also be continued.

5. The material for trial of Black stem rust will be maintained and further expanded.

6. The multiplication of improved seeds of 168, 224 and 808 will be done.

Gram Breeding.

1. The comparative trials of important strains will be continued.

Breeding of minor crops.

1. Rala No. 4 will be compared with Local.

2. The promising Tur strains will be compared among themselves and with Local.

3. The selections in Til will be compared.

M. L. PATEL,

Crop Botanist to Government of Bombay, Karjat.

APPENDIX K.

SUMMARY OF THEWORK DONE UNDER THE PLANT PATHOLOGIST TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1938-39.

Dr. B. N. Uppal held charge of the section throughout the year.

Mr. M. K. Desai continued to work as Assistant Plant Pathologist under a temporary scheme of research on koleroga of betel nut with headquarters at Sirsi.

Mr. J. D. Ranadive and Mr. Y. S. Kulkarni continued to work as Pathological Assistants on the Cotton Wilt Breeding Scheme, Poona. Mr. S. P. Shah worked as Pathological Assistant on the Cotton Wilt Breeding Scheme for Surat area, with headquarters at Shera near Ankleshwar.

Mr. V. P. Bhide continued to work as Sann Investigator under the scheme of research on wilts in sann-hemp and *Lathyrus sativus* financed by the Trustees of Sir Sassoon David Trust Fund.

Mr. B. M. Hanagodimath was appointed Assistant under the scheme for cereal rust investigation, with effect from October 1, 1938.

Dr. M. C. Desai joined his duties as Assistant Plant Pathologist under the Bombay Virus Diseases Scheme, on April 1, 1939.

I have also to note that no cases of corruption on the part of Government servants under my control came to my notice during the year.

Education.

The Plant Pathologist to the Government of Bombay was assisted by the Assistant Professor of Mycology in the teaching of plant pathology and agricultural bacteriology at the College of Agriculture, Poona. During the year there was one special student engaged in research in plant pathology.

Research.

1. *Fusarium wilt in sann hemp.*—The work on the relative pollinating efficiency of *Apis* and *Megachile* bees was continued during the year. The results show that there is no marked difference between the two seeds in respect of their development, size, etc. Although *Apis* bees gave a larger number of pods than *Megachile* bees, the latter seem to be more efficient in effecting pollination as they possess a longer abdomen and live for a longer time than *Apis* bees when enclosed in a cage. It is, however, still to be determined whether the plants produced from *Apis*-stimulated seeds are less vigorous than those originating from

Megachile-stimulated seed since it is likely that in the former case self-fertilisation occurs to a large extent.

The F_2 of the cross between D-IX and a homozygous susceptible variety of sann hemp was grown in soil temperature tanks maintained at 26°-27° C. None of the plants wilted, and it was later discovered that the fungus was not actively pathogenic. All the plants (227 in number) were therefore transplanted in the field and selfed. The F_3 progenies will be tested next year in soil temperature tanks.

A fresh cross between D-IX and a homozygous susceptible individual has been made this year. F_1 will be tested next year.

The selfed seed of D-IX was multiplied under giant muslin cages on the College Farm. Due to heavy rains received during the period of flowering, the flowers remained unfertilised and dropped down. It was also observed that during heavy rains and in cloudy weather, the bees do not visit flowers which are therefore not fertilised.

Periodic sowing of sann hemp is being done to determine the best date of sowing and whether it is possible to grow the crop successfully in the hot months (March to May) when practically no sann hemp is grown near Poona.

The mass-pollinated seed was further multiplied on the Government Farm at Dharwar. There were about 18 lbs. of seed, half of which was sown under irrigation and the other half as a dry crop. In both cases the crop was good, although there was a slight attack of pod-borer.

2. *Wilt in Lathyrus sativus.*—The relation of temperature to the linear growth of the *Fusarium* causing wilt in *Lathyrus sativus* has been studied. The fungus makes good growth at 17° to 31° C. and the optimum temperature of growth lies between 25° and 27° C. The fungus makes no growth below 11° and above 33° C.

In another experiment the temperature at which wilt in *lang* reaches its maximum development was tested. It was found that at 25°C. the disease was characterised by the earliness of attack and severity of infection. At lower and higher levels the wilt was late in developing and was also less severe. These results show a close parallelism between the development of wilt in its host and the vegetative growth of the causative organism in culture as measured by the colony diameter. This experiment will be repeated.

The fungus has been shown to produce the enzymes diastase, lipase, erepsin, trypsin, amydase, inulase and emulsin, but does not produce cytase. These results show that the fungus can utilise a wide range of nutrient substances.

A plot has been heavily and uniformly infected in connexion with the work on the selection of wilt-resistant varieties of *Lathyrus sativus.*

The seeds of the following varieties of *lang* (*Lathyrus sativus*) received from the Institute of Plant Industry at Indore were tested in the infected plot for resistance to wilt: Type 1, plant 2 and plant 37; Type 4, plant 7; Type 6, plant 3; and Type 148, plant 2.

Of the five plants tested, Type 1, plant 37 and Type 148, plant 2 are very promising as they did not suffer any mortality from wilt. They are also vigorous growing types and set seed profusely.

Fourteen selections for wilt resistance have been made from the general crop grown for making compost in the infected plot at Poona. Some collections of resistant plants have also been made in the Broach district. All this material will be tested next year in the infected plot.

3. *Powdery mildew of betelvine.*—Large-scale trials were made at Bassein and Kelva Mahim on the control of betelvine powdery midlew with sulphur dusting. In new gardens the mildew was checked with one application of 300-mesh sulphur dust, but two dustings were necessary for effective control in old plantations.

The results of the work on betelvine mildew will now be written up for publication.

4. *Fig rust.*—The value of Sulsol in the control of fig rust was tested during the year. The fungicide was applied in the strength of 2½ in 100, and, commencing with November, applications were made at intervals of one month. The experiment was again inconclusive as no rust appeared during the season.

5. *Twig blight and fruit rot of mango.*—It was reported last year that seedlings of *Alphonso* and *Piari* varieties of mango could be readily infected with *Phoma* sp. Tests made during the year have shown that, although *Alphonso* and *Piari* varieties are readily infected, seedlings of country varieties of mango did not take infection. The ability of the country varieties to resist infection has been shown to be due to substances present in the bark since a water extract of the bark of *Alphonso* and *Piari* varieties stimulates germination of the fungus spores, whilst an extract from the bark of country varieties inhibits germination.

The physiology of the causative organism has been further studied.

6. *Damping off in tobacco seed-beds.*—Experiments in the control of damping off in tobacco seed-beds were carried out at the Tobacco Station, Nadiad. Cuprous oxide was used as a seed dressing at the rate of one ounce of dust to four pounds of tobacco seed; the treated seed was then sown in beds. Some of the beds were also treated with Cheshunt compound and then sown with tobacco seed and in some cases with seed previously dusted with cuprous oxide. Cheshunt compound was applied to the beds at weekly intervals after emergence. Damping off was effectively controlled in beds treated with Cheshunt compound which caused slight injury to the seedlings. Cuprous oxide as a seed dressing proved ineffective in checking infection.

7. *Soft rot of ginger.*—The fungus causing soft rot in ginger in Surat has been determined to be *Pythium myriotylum*. The oospores measure from 16·5 to 30 u and the oogonia from 22 to 41 u. The conidia germinate by germ-tubes, but germination by the formation of zoospores has not been noticed so far. The fungus produces oogonia and oospores in abundance in all culture media tested.

The physiology and morphology of the organism are being studied in detail.

8. *Mottle-leaf of mosambi.*—Mottle-leaf of mosambi (*Citrus sinensis*) occurs in a severe form in Gujarat and in some gardens in the Deccan. The value of zinc sulphate-lime mixture (5-2½-50), to which casein or Agral I or II was added as a spreader, was tested during the season. The results were very promising since in all cases the affected trees recovered from the disease by the production of normal green leaves.

9. *Panama disease of bananas.*—Varietal trials of bananas were made during the year in a heavily infected field at Rajuri near Narayangaon. The local variety, *Sone*, was completely susceptible, but *Kali* and *Basrai* proved highly resistant. *Basri* is also a good commercial variety.

10. *Fixation of nitrogen in rice soils.*—*Azotobacter* shows a marked periodicity due probably to external climatic conditions in the soil since it is very abundant during the monsoon but suffers a sharp decline in numbers in the dry season following the rains until it becomes scarce and almost disappears from the soil in the cold season and during hot months. The seasonal fluctuations of microbial activity may also have something to do with the growth of the crop since fallow does not support any population of *Azotobacter*-like organisms.

11. *Koleroga of betel-nut.*—Experiments made during the year have shown that beterothallic strains of *Phytophthora arecæ* may occur on areca nut in nature. Isolations of the fungus were made from diseased nuts in different localities in North Kanara and grown in different combinations on Quaker-oats agar medium in Petri dishes. The results show that the Tayagli and Analgar strains (named after the villages in which they occur) possess similar sexual potentiality and always produce oospores when paired with any of the other six strains. It appears that the sexual strains of the fungus have become definitely isolated in different areas, and this localisation of the two sex strains may explain the absence of oospore formation in nature. The case reported by Narashimhan (*Phytopath.* 20, 201-14, 1930) when Coleman once obtained oospores in areca nuts placed in Roux tubes and inoculated with a culture of *P. arecæ*, can now be satisfactorily explained by assuming that the nuts were carrying natural infection with one of the strains occurring on areca nut trees and that the culture used for inoculation must have been of the opposite sex.

Lethalate Wetting Fluid was tested for its property as a "sticker" in spraying trials against koleroga of betel-nut. Comparisons were

made with the spray in which resin soda is used in North Kanara. No definite conclusions could be drawn as the disease was not serious during the year; but a general examination of the treated nuts showed that Lethalate Wetting Fluid compared favourably with resin soda as an adhesive. Further trials are necessary to confirm these observations.

12. *Cotton Wilt Breeding Schemes.*—The following is a brief summary of the report of the work done during the year. :—

(*I*) *Broach Section.*—(*a*) *B.D.* 8.—Progenies of 5 cultures of B.D. 8, which showed mortality from 11·1 to 38 per cent. during 1937–38, were tested under conditions of optimum infection in 1938–39. These progenies segregated, showing a range of 0 to 4·2 per cent. of wilt. Further testing will be continued.

(*b*) *New Selection* 12.—Progenies of 7 cultures of New Selection 12, which showed less than 25 per cent. wilt in 1937–38, were selected for testing in 1938–39 in the glasshouse. These segregated, showing a range of 0 to 10·3 per cent. of wilt. Further tests will be continued.

(*c*) *Crosses.*—The cross (B.D. 8 × G.A. 26) F_6-76 was tested under conditions of optimum infection in a glasshouse. There was no mortality from wilt; but this needs confirmation.

The cross between B.D. 8 and New Selection 12 was also tested in the glasshouse, but none of the cultures are yet completely wilt-resistant.

The backcross (B.D. 8 × G.A. 26) × B.D. 8, was further tested in the glasshouse, and the segregates under test are now showing a very high degree of resistance. Indeed, one of these segregates, [{(B.D. 8 × G.A. 26) × B.D. 8} F_3-1]—1-1, was completely free from wilt. Further testing will be continued.

The backcross (B.D. 8 × N.S. 12) × B.D. 8, is also showing a very high degree of wilt resistance, about 99·5 per cent. resistance.

(*d*) *New Selection* 49.—This material is also showing a very high degree of resistance, but testing will be continued.

(*e*) *Russian herbaceums.*—Only culture 2,761–1 is promising as it is completely free from wilt. The culture 3,035–2, though also free from wilt, makes a poor growth. The other cultures, viz., 2,772–1, 2,772–2 and 2,726–1, are not true herbaceums and they are being transferred to the Cotton Breeder, Jalgaon, as they probably are neglectum types.

(*f*) *District collections.*—Fresh collections were made in the district last year, and out of 26 collections, sixteen collections were highly susceptible to wilt. In the remaining 10 collections wilt ranged from 1·7 to 13·7 per cent. These will be further tested.

(*g*) *Fresh material.*—The Cotton Breeder, Broach, has supplied fresh material for testing at Poona. (B.D. 8 × S. 7-1) F_5 seems to be very

promising in regard to wilt resistance. Further testing will be continued.

(*h*) *Wilt in relation to soil moisture.*—The experiment to determine the relation of soil moisture to wilt in cotton was repeated. The results confirm the conclusions arrived at last year that wilt infection is at its optimum in a range of soil moisture of 40 to 60 per cent. based on the water-holding capacity of the soil.

(*i*) *Study of wilt inheritance.*—A cross was made between K.F. (a 100 per cent. wilt resistant strain) and 1027 A.L.F. (a highly susceptible strain) to study the mode of inheritance of wilt resistance in cotton. The F_1 will be tested in pot culture in the glasshouse and also in soil temperature tanks maintained at about 26° C.

(*II*) *Jalgaon Section.*—(*a*) *Million Dollar.*—In 1937-38, 178 plants of Million Dollar were transplanted in the wilt-sick plot. The progenies of 138 transplants were tested in the glasshouse during the last season. Not a single plant died of wilt although the plants exhibited leaf mottle. Selected plants free from leaf mottle were transplanted in the infected plot, and their progeny would be tested during the season 1939-40.

(*b*) *New Million Dollar.*—Selfed seed of this strain was originally obtained from the Department of Agronomy, Nanking University, China. It was tested in 1937-38 under optimum conditions of infection in the glasshouse at Poona and did not suffer any mortality from wilt. Selfed seed from 13 best plants was again tested last year, and all plants remained completely free from wilt although leaf-mottle was in evidence. Tests will be made for another season.

This material is very promising since in two seasons' tests no mortality occurred even under optimum conditions of infection in the glasshouse.

(*c*) *Chinese R_1 Spotless* 51.—The selfed seed of this strain was obtained from the Institute of Plant Industry at Indore. It was tested in 1936-37 at Poona when it gave a mortality of 53·4 per cent. Sixteen best plants from the survivals were transplanted in the infected bed and selfed. The progeny of ten transplants was tested in 1937-38; nine cultures remained free from wilt and one culture gave a mortality of 1·6 per cent. Eight cultures were further tested in 1938-39, and none of these has given any death. Thus it has been possible to select from a highly susceptible material, a 100 per cent. wilt-resistant race in two seasons. Testing will be continued for another season.

(*d*) *Crosses.*—Jarila has been crossed with Million Dollar, New Million Dollar and with Chinese R_1 Spotless 51. The F_1's will be tested during the next season and backcrossed to Jarila in each case. The material will then be transferred to Jalgaon for further study. The Cotton Breeder, Jalgaon, would select the best material for transfer to Jalgaon.

(*e*) *Study of wilt inheritance.*—A cross between New Million Dollar (a 100 per cent. wilt resistant strain) and Dhulia 2 (a highly susceptible strain) has been made with a view to studying the mode of inheritance of wilt resistance in cotton. The F_1 will be tested in pot culture in the glasshouse and also in soil temperature tanks maintained at about 26°C.

With a similar purpose in view, a cross between Chinese R_1 Spotless 51 (a 100 per cent. resistant cotton) and Dhulia 2 has been made, and F_1 will be tested during the coming season.

(*III*) *Surat Section.*—Four crosses were grown in the wilt sick soil at Shera during the season. Two of these crosses, $\{$ (B.D.8 × 1 A.L.B.) × 1027 A.L.F.) $\}$ F_5 and $\left[\{\{(B.D.8 \times N.S.12) \times 1027\} \times 1027\} \times B.D.\ 8\text{-}B_3\right] F_1$, will be studied further as they show promise of yielding a wilt-resistant race of cotton. The other two crosses have been rejected.

The progeny of 66 plants of 1027 A.L.F. selected for wilt resistance at Surat was tested in the wilt sick soil at Shera. Fifty-seven selections proved completely susceptible, and from the remaining nine selections 12 plants have been retained for further work.

Four cultures of selection 4-1 out of a lot of 14 selections derived from the district material grown in the wilt sick soil at Shera are promising and have been retained for further work. Two other promising selections, tested at Surat during the current season, will be transferred to Shera for test in the wilt-infected plot.

Three new crosses, (8-1 × K.F.), (8-1 × N.S.12) and (8-1 × B.D.8), have been made at Shera this year.

The cross, (B.D.8 × G.A.26) F_8, the material of which was supplied by the Cotton Breeder, Broach, was grown at Surat this year and would be rejected as it had short staple and coarse feel. Six cultures of the back-cross, (B.D.8 × G.A.26) × B.D.8 F_6, also supplied by the Cotton Breeder, Broach, were tested at Surat, and eight plants of only one culture (1-6) have been selected for futher tests in the wilt sick soil at Shera.

13. *Wheat Rust Scheme.*—The Imperial Council of Agricultural Research has sanctioned the scheme for a period of five years at a cost of Rs. 51,280 although the provision of funds has been approved for three years in the first instance. A suitable site for the glasshouses has been selected at Mahableshwar, and the Forest Department has agreed to clear the area. It is hoped that the construction of the glasshouses at Poona and Mahableshwar would be completed by May 1940.

Arrangements have been made for the recruitment of the gazetted staff through the Federal Public Service Commission.

14. *Bombay Virus Diseases Scheme.*—An insect-proof glasshouse 60 feet × 15 feet, and an insectary, 20 feet × 15 feet, have been constructed. These houses are of steel, and the windows have been fitted with 40 mesh phosphor bronze wire gauze and are also provided with steel shutters with glass panels, which open outside. A portion of the roof of the glasshouses has been fitted with wire gauze so as to render the houses insect-proof when the upper portion of the roof is lifted. In fact, the houses have been so constructed as to make them suitable for work for most of the year. A large potting house has also been built in connexion with these houses.

15. *Black spot of mango.*—No work has been done during the year due to pre-occupation with other work.

Advisory work.

A large number of inquiries on plant diseases were, as usual, dealt with during the year, and advice was given promptly whenever required. These enquiries have been steadily increasing during the past few years.

The Government of Bombay sanctioned a special grant of Rs. 4,000 for demonstration of methods of control of mango hoppers and mildew. These demonstrations were made in specially selected gardens in three centres in the Ratnagiri district, and two centres each in South Gujarat and the Bombay Suburban district. Sulphur dusting, if done judiciously and at the proper time was shown to check both the hoppers and mildew although in certain centres the trials were inconclusive due to the absence of mango hoppers. It is proposed to continue the demonstration for another year.

Similar demonstrations were carried out, with the help of a special grant from Government, in the case of aphis and mildew on peas, mottle-leaf of mosambi (*Citrus sinensis*) and powdery mildew of betel vines. All these demonstrations were successful.

The work on the disease survey of the Province was continued during the year.

Miscellany.

Necessary facilities were provided to Dr. K. C. Mehta for making stationary slide exposures at different stations in the Province of Bombay in connexion with his studies on the dissemination of wheat rusts in India.

Mr. B. M. Hanagodimath was appointed for a period of five months (October to February) to carry out a survey of places of oversummering of black rust of wheat in this Province and to collect information on the incidence of black rust in relation to meteorological data.

Another consignment of Peerless Dust Guns was imported from America with the help of an advance from the Personal Ledger Account of the Director of Agriculture, Bombay. The machines were sold to *bona fide* growers of this Province at a cost of Rs. 38 each.

The Government of Bombay made a special grant of about Rs. 5,000 for the purchase of Saccardo's Sylloge Fungorum, which was arranged through the Director of the Imperial Mycological Institute, London.

Dr. B. N. Uppal continued to work as Secretary-treasurer of the Agricultural Graduates' Employment Board.

Ten meetings of the Insect Pest and Plant Disease Committee, of which Dr. B. N. Uppal is the Secretary, were held during the year. A large number of insect pests and diseases were dealt with at these meetings. There is need for additional clerical assistance to cope with the growing work of the Committee.

Publications.

(1) UPPAL, B. N.; Crop Protection from Fungi. *Proc. Second meeting of Crops and Soils Wing of Board of Agrl. and Animal Husbandry in India*, 1937, pp. 329–333.

(2) UPPAL, B. N. and M. K. DESAI. Koleroga disease of areca nut. *Current Sci.* 8, 122–123. 1939.

B. N. UPPAL,

Plant Pathologist to Government.

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APPENDIX H.

Summary of Work done under the Agricultural Chemist to Government, Bombay Province, Poona, during the year 1937-38.

I held charge of the office and laboratories of the Agricultural Chemist throughout the year except for a period of one month and one day from 8th May to 9th June 1938 when I was on leave on average pay. During my absence on leave Mr. N. Narayana, Assistant Professor of Chemistry, held charge of the office of the Agricultural Chemist in addition to his own duties.

Teaching.—The teaching of the undergraduate students at the Poona Agricultural College took a considerable amount of time of the staff of the Agricultural Chemist. Both the Assistant Professor Mr. N. Narayana and the Lecturer Mr. V. S. Abhyankar worked very indefatigably in the discharge of their duties, many times at very great inconvenience to themselves to cope up with the additional teaching that devolved upon this Section during the year under report.

Three new students joined the laboratory for post-graduate work. One of them left almost immediately as he secured a job elsewhere. The other two together with two more students of the previous year worked throughout the year.

Analytical and Advisory.—The number of samples received for analysis was a little more than 600. Samples from departmental farms and from other Government departments formed the largest quota as usual as shown under :—

Name of sample.	Government samples.	Private samples.
Soils	220	4
Waters	23	6
Manures	27	9
Dairy products	22	7
Fruits	50	..
Seeds and grains	63	4
Foods and feeding-stuffs	44	1
Gul	10	3
Miscellaneous	116	2
Total ..	575	36

A large number of soil samples for nitrogen determination was received this year from the Agricultural Meteorologist, Poona, in connection with

some of the experiments carried on by him. The College Farm sent eighteen samples for nitrogen determination in connection with a green-manuring experiment carried on at that farm. Fourteen samples were received from Surat farm where a similar experiment is being carried out. Twelve samples were analysed for the Plant Pathologist to Government, Bombay, Poona, in connection with his studies on the fixation of nitrogen in rice soil at Karjat. A number of soil samples was received for analysis from the various District Agricultural Overseers which they had collected from the cultivators' fields. Three samples were received from outside the Bombay Province, one from New Zealand, one from Japan and one from Kutch State. One sample of soil from a private gentleman was analysed free of charge under Government Resolution, General Department, No. 9101, dated 17th November 1937.

Among the manures analysed for the public six samples were sent by the manure manufacturing firms and three by private farms. One sample of compost made from city refuse sent by a firm in Bombay was found on analysis to be rather poor in nature.

The dairy products included three samples of casein prepared by a firm near Anand. The analysis showed that the samples were fairly good. Nine samples of cream were analysed for the Imperial Dairy Expert in connection with his study on the flavour of butter made from Sindhi cow and Jersey cow milk. Four samples were analysed for the Agricultural College Dairy, Kirkee. Two samples of ghee brought from a bazar shop from one and the same tin, one of liquid ghee from the top and the other of solid ghee from the bottom of the tin, showed that the upper liquid ghee contained more of the characteristic ghee fats than the lower solid ghee.

Forty-four samples of banana were analysed for the Horticulturist to Government, Bombay, Poona, in connection with a manurial experiment carried on by him. Four samples of pineapple of the Kew and Queen variety grown at Kumta farm were analysed for the Superintendent, Kumta Farm.

Three samples of Gul prepared from toddy by the All-India Village Industries Association at Vile Parle and at Hosur were analysed free of charge under Government Resolution, General Department, No. 9101, dated 17th November 1937.

Seventeen samples of wheat grain obtained from the Bijapur market were analysed for the Imperial Council of Agricultural Research. The Economic Botanist, Poona, sent eighteen samples of safflower seed for determining their oil contents. Eight samples of jowar grain were received from the Superintendent, Mohol Farm, to determine their food value. The Superintendent, Kumta Farm, sent thirteen samples of different strains of rice for the determination of their food value. Two samples of Mohwa seed supposed to be damaged in transit were sent by the G. I. P. Railway to determine the nature of damage.

APPENDIX L.

SUMMARY OF WORK DONE UNDER THE LIVESTOCK EXPERT TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1938–39.

Personnel.—Mr. Edw. J. Bruen held charge of the Livestock Section for the whole of the year.

The work done by the Livestock Expert to Government can be classified under the following headings:—

(1) *Livestock Improvement.*—Pedigreed Livestock breeding on the Government's Farms and extension of pure bred stock in villages.

(2) Rural Uplift Work as far as livestock improvement is concerned.

(3) Palghar Dairy District Scheme.

(4) Work on Livestock research financed by the Imperial Council of Agricultural Research.

(5) Work in connection with the Provincial Fodder and Grazing Committee.

(6) Work in connection with the Expert Cattle Committee.

The progress made during the year under each of the headings is embodied in the following report. The activities of this Section mainly are:—

(*i*) The Advisory work.

(*ii*) Propaganda and teaching in villages.

(*iii*) The breeding of pure bred stock and their improvement on Government subsidized and private cattle breeding farms.

(*iv*) The breeding and research in poultry at the Government Central Poultry Farm, Kirkee, and other private and Government aided farms.

(*v*) The improvement of village poultry by introduction of pure bred fowls.

(*vi*) The improvement of cattle in villages by placing out pure bred premium bulls.

(*vii*) The encouragement of keeping better cattle by holding cattle shows, rallies and demonstrations.

(*viii*) The improvement of the milch buffalo.

(*ix*) The registration of pure bred stock of the various breeds in Breed Herd Registers.

(*x*) Propaganda in storage and utilisation of fodder in the form of hay and silage.

(*xi*) The working of His Excellency the Viceroy's Gift Bull Scheme.

(*xii*) The working of the Livestock Improvement Act.

Advisory Work.—Due to the impetus given by the Rural Uplift Work and His Excellency the Viceroy's Gift Bull Scheme, we have been able to extensively distribute pure bred stock produced on Government farms and in the intensive cattle breeding areas. Inquiries regarding cattle, dairying, sheep and poultry are on the increase. District Village Improvement Committees were advised with regard to Poultry and Cattle Improvement. A scheme for establishment of Animal Husbandry and Dairying Institute at Anand in Kaira District was prepared and submitted during the year.

The Vocational Schools at Godhra and Bijapur were supplied with a set of poultry houses and yards and also milch cows, breeding bulls and working bullocks. The judging of cattle at the second All India Cattle Show at Delhi in February 1939 was done by the Livestock Expert. The material for the Expert Cattle Committee appointed by Government as per Government Resolution, Revenue Department, No. 8409/33, dated 14th April 1939 was prepared and submitted during the year.

Information on the present position of Livestock in the Bombay Province was supplied to the Bombay Economic Enquiry Committee as well as to the National Planning Committee.

Propaganda.—The demand for better cattle, sheep and poultry far exceeds our resources to supply the same. Propaganda is generally taken to mean the advancement of a cause through lectures, distribution of leaflets, etc. In Livestock Improvement, however, example has to come first and precept afterwards. The pedigreed stock put out in villages has to be practically useful before a talk can be of any avail and particularly because, it takes some years before the utility of the stock is appreciated. For this reason the propaganda in villages selected has to be continuous and in charge of workers whose tenure is not shifted often.

During the year sanction was accorded to the employment of the following additional staff for cattle improvement:—

(1) One Divisioral Inspector of Cattle Breeding,

(2) Cattle Kamgar,

as per Government Resolution, Revenue Department, No. P, 23 (*a*) 20658, dated 5th August 1938. Thus the total of district staff for Livestock Improvement was 5 Divisional Inspectors of Cattle Breeding and 9 Cattle Kamgars.

(*a*) *Premium Bulls.*—The number of Premium Bulls working in different divisions of the cattle breeding areas is shown below :—

Name of Division.	Premium Bulls working on		Remarks.
	1st July 1938.	1st July 1939.	
South Central Division	71	75	
North Central Division	27	66	
Southern Division	56	62	
Northern Division	39*	54*	*21 Gift Bulls.
Palghar (Bombay Division)	....	21	
Total ..	193	278	

Note.—There were 70 bulls working during the year whose terms expired before 1st July 1939 as against 56 of the previous year.

(*b*) *Shows and Cattle Rallies.*—Cattle Shows and Rallies play a very important part in the propaganda of Livestock Improvement work. In order to stimulate real interest among cattle breeders, it is necessary to create healthy competitions by organising local cattle shows in the heart of the cattle breeding areas and recognising merit by offering substantial prizes.

The pedigreed bulls put out in villages bring about improvement in the progeny but selection and proper care of the offspring must follow in order to maintain improvements. In the selection of their stock the breeders naturally expect us to give the standard of excellence for their guidance. These functions can only be fulfilled through the agency of cattle shows and rallies.

During the year 13 cattle Shows and 8 cattle Rallies were held as against 12 and 5 respectively during the previous year. The most important of the cattle shows were two—one at Kandivli and the other at Pandharpur.

A fairly large Gir Cattle Show was organised at the time of the celebration of the Golden Jubilee of the Bombay Gowrakshak Mandali at Kandivli. The Show was opened by His Excellency the Viceroy of India (Lord Linlithgow) on 23rd January 1939. The Show was a notable success. 371 Gir cattle were exhibited. The Mandali brought out a Golden Jubilee Souvenir to commemorate the occasion and distributed copies to various cattle breeding institutions in the country.

A Khillar Cattle Show at Pandharpur was organised in collaboration with the Sholapur District Congress Committee on 16th to 18th December 1938. The Honourable Minister for Revenue, Mr. Morarji R. Desai, graced the occasion by attending on 18th December 1938 and distributed prizes to various winners. The Honourable Minister was highly gratified to note that superior cattle were bred under the direction of the Livestock Section on this side of the Deccan. Mr. G. W. Joshi, the President of the Sholapur District Congress Committee, rendered valuable help in organising the Show. The following institutions deserve thanks for financial help to the Pandharpur Cattle Show :—

	Rs.
(1) The Trustees of the Dhwaj Gowrakshak Trust, Bombay, contributed ..	300
(2) The District Local Board, Sholapur ..	100
(3) The Village Improvement Committee, Sholapur	50
Total ..	450

Two Cattle Rallies of the Kankrej breed were organised in November 1938—one at Dholka and the other at Bhojwa. The strength of the rallies was 200 and 400 respectively. The Ahmedabad District Agricultural and Livestock Association contributed Rs. 75 for each of the rallies for awarding prizes. The Patadi Durbar deserve thanks for assisting the rally at Bhojwa.

One more activity in connection with the cattle shows, undertaken by this Section needs mentioning. It is the part this Province has played in sending cattle of different breeds to the Second All India Cattle Show held in Delhi in February 1939 to show what is being done in the Province. In all 48 animals were sent for competition. The Government of Bombay contributed Rs. 1,750 in connection with the expenses for sending these cattle to Delhi. The amount of money won by the cattle sent from this Province was Rs. 1,400 in cash, excluding the various class medals, and Cups.

(c) *Registration of animals.*—The following table gives the registration of pure bred stock up-to-date.

Division.	Number of animals registered up to 1937-38.	Number of animals registered during 1938-39.	Total up to end of June 1939.
1	2	3	4
Northern	1,048	520	1,568
North Central	267	243	510
South Central	886	354	1,240
Southern	629	153	782
Total ..	2,830	1,270	4,100

(d) *Application of the Livestock Improvement Act of 1933.*—The Act has been applied to 47 villages in the Province of Bombay as shown below :—

Name of District.	Number of villages.	Date when application of the act was gazetted.
East Khandesh	2	24th July 1936.
Dharwar	27	31st May 1937.
Sholapur	12	8th January 1938.
West Khandesh	6	30th March 1939.

During the year 23 villages in Ahmedabad District and 7 villages in East Khandesh have been recommended for the application of the Act with the approval of the respective district Local Boards. In 15 villages where the Act has been applied, 271 castrations of scrub bulls were done during the year. The remaining villages are being taken up for the purpose. So far no serious difficulty has been encountered in castrating the scrub bulls.

His Excellency the Viceroy's Gift Bull Scheme.—The number of Gift Bulls made available by the Livestock Section was 38 during the year as against 127 and 90 during the two preceding years, thus making a total of 255. It was found that the receiving of donations from the public for the purchase of bulls did not solve the problem of their maintenance. In areas where cattle breeding is not valued, people would not come forward

to maintain the bulls. Many complaints were received during the year with regard to the supposed failure of the Gift bulls in breeding. On investigation it was found in majority of the cases that the bulls were neglected and under-fed ; the bulls being placed in unsuitable villages with unsuitable agents. Government orders on centralisation and control of Livestock Improvement work under one agency are awaited.

General.—I am pleased to bring to the notice of Government the very valuable work done by my staff. They have all without exception worked to the best of their abilities. The work of this Section is increasing daily and could be made still more useful if I had more staff. We are doing our best with the staff available but the heavy nature of the work is beginning to find our weakness (i.e., lack of staff). This Section has made contact with all social workers, particularly the more influential and we are now tackling this question of cattle improvement in complete harmony.

Mr. D. B. KOLHE, Assistant Livestock Expert, has been most helpful to me relieving me of a large amount of my touring and with answering enquiries and helping up schemes.

Mr. Y. K. Phadke has once again shown his abilities as Head Clerk of my office to keep up-to-date. It has been necessary for the Head Clerk and his office staff to attend to office on holidays and Sundays included.

NORTHCOTE CATTLE BREEDING FARM, CHHARODI.

Personnel.—Mr. B. B. Jamaspjina held charge of the Farm throughout the year.

Season.—The rainy season started in June and was well distributed. In July 18½ inches of rain was received in two instalments which washed away the previous sowings and half of the farm was under water for three weeks. Re-sowing had to be done in August under not too favourable conditions. Another heavy downpour was received preventing tillage and giving rise to rank weeds. September and October were almost dry. The total rainfall was 27·57″ as against 37·15″ of the previous year. The cold season was normal and healthy while the hot season was very hot.

Cultivation and crops.—Although the amount of rainfall was normal due to uneven distribution and heavy downpours whatever plots could be sown were overgrown with rank weeds, which were ensilaged along with the sown fodder and grasses.

Silage-making.—All available sources of green grass were tapped to make as much silage as possible due to the failure of the cultivated fodder crops. The total silage filled in six silos was 568,047 lbs. as against 635,180 lbs. of the last year. The work of silo filling commenced on 8th August 1938 and was finished on 26th September 1938 rather a longer period than usual.

Hay-making.—Hay very much in excess of the normal requirements of the farm had to be made due to the transfer of the Surat Dairy herd and the expected merge of the Chharodi Farm with the proposed Animal Husbandry Institute at Anand. The total quantity of hay made was 991,735 lbs. as against 695,632 lbs. of the previous year. The charges of making hay work out Rs. 1-8-0, per 1,000 lbs. as against Rs. 2-2-0 of the previous year, the reduction being due to the increased quantity of hay made. The operations of hay making commenced on 25th October 1938 and were finished on 12th March 1939.

Livestock.—The strength of the herd during the year stood as under:—

	Opening.	Closing.
Stud bulls	10	11
Cows	85	113
Heifers over one year	54	72
Female yearlings	72	89
Young bulls over one year	23	20
Male Yearlings	38	58
Buffalo Bulls	40	13
Bullocks	58	62
Total ..	380	438

The increase was due to the transfer of 86 heads of cattle from Surat Farm Dairy. Twenty-eight heifers calved during the year as against 22 during the previous year. Many of these heifers calved at a time when Foot and Mouth Disease was prevalent on the farm and consequently, several calves were lost dispite all precautions. As regards the milking capacity of these 28 heifers 10 can be classed as very good and good milkers, 9 can be classed as very fair milkers and 9 can be classed as poor milkers. Five of the poor ones have since been disposed of.

There were 100 births during the year—53 females and 47 males as against 44 females and 33 males during the previous year.

Diseases and Deaths.—This was another rather unfortunate year for the herd. At the beginning of the rains H. S. appeared suddenly even though the herd was fully protected by vaccine. One Surat cow died in a few hours after showing signs of restlessness and later on one calf succumbed. All the herd had to be vaccinated again. The re-vaccination affected adversely the milk flow of the cows.

Foot and Mouth appeared at the end of December 1938 and raged very strongly for one month, taking a toll of 5 calves. Three animals died of venomous bites.

Sales.—The total number of animals sold or issued during the year was 105 as against 59 in the previous year. The total realisation was Rs. 5,604 and the average per head came to Rs. 53–6–0 as against Rs. 93–0–3 for the previous year.

Cattle received.—Due to the abolition of the Surat Dairy Farm, the following cattle were transferred to the farm :

Cows	23
Heifers	25
Young Bulls	21
Calves	12
Castrated young males	5
	86

Bulls issued.—Forty-one breeding bulls were issued during the year of which 23 were cow-bulls and 18 buffalo-bulls.

Breeding Policy.—The breeding policy adopted on the farm is to produce an economical animal with the desired breed characteristics. Thus we have kept foremost in our mind the important characterisation of (1) early maturity, (2) regularity in calving and (3) the type. During the year 28 heifers have calved, out of these 6 heifers have calved before the age of 4 years, 19 heifers have calved between 4 to 4 years—3 months, and three have calved over 4½ years. The earliest to calve is "Ravti" 22–34 at the age of 3 years and 4½ months. The effect of different breeding bulls in the transmission of the character of "early maturity" in their female progeny which calved for the first time during the year is shown in the statement appended herewith (Appendix No. I). A Statement showing progressive improvement wrought by all bulls since 1917 in respect of transmission of "early maturity". Character is also appended herewith (appendix No. II). A statement showing regularity in calving is appended herewith (*vide* appendix III).

Milk Production.—The total annual production of milk was 147,517¾ lbs. as against 133,623 lbs. for the previous year. 118 cows individually produced the milk as against 94 cows of the last year. The average milk-yield per adult cow of the herd works out 1,485 lbs. 8 ozs. as against 1,476 lbs. 15 ozs. for the previous year.

During the year under report 15 cows have yielded over 3,000 lbs. of milk in a lactation and have in addition suckled calves. Of these 7 cows have yielded between 4,000 to 5,000 lbs. of milk and 2 cows have yielded over 5,500 lbs.

Cattle Breeding Farm, Bankapur.

Personnel.—Mr. S. K. Angadi was appointed as the Manager of the Farm from 5th October 1938 and continued to hold the charge till the end of the year. Mr. A. B. Gadagkar was in charge of the Farm from 1st July to 4th October 1938 when he was transferred as Divisional Inspector of Cattle Breeding, Southern Division, Dharwar.

Season.—There were no anti-monsoon showers during the year and consequently, the preparatory tillage had to be postponed till the onset of the Monsoons in the middle of June. The sowing of *kharif* crops was completed by the end of June. With well-distributed rainfall the season was favourable both for *kharif* crops and the grass-lands. After the rain-fall of 1 inch and 5 cents in the first week of October the *rabi* crop received a good start but due to long break the pulse crop was below normal. The total rainfall during the year was 26 inches and 60 cents. as against 21 inches and 60 cents of the previous year.

Livestock.—The year opened with 151 heads of cattle and closed with 124 as shown below :—

	Opening 1st July 1938.	Closing 30th June 1939.
Stud bulls	4	3
Cows	39	36
Heifers	37	29
Young bulls	35	19
Cow calves	13	17
Bull calves	12	12
Bullocks	9	8
Buffalo Bull calves ..	2	..
Total ..	151	124

The whole herd is bred and born on the farm and it exhibits a high degree of uniformity in type, colour and confirmation. The breeding policy followed at the farm aims at (1) early maturity (2) regularity in breeding and (3) characteristic type and confirmation of the Amrit Mahal breed. During the year under report 11 heifers calved ; of these 3 heifers calved between the ages of 3½ to 3½ years and 8 calved between the ages of 3½ years to 4 years. There were 32 calves, 11 male and 21 female born during the year as against 28—15 male and 13 females of the last year. 13 farm bred bulls were issued as Premium Bull in Dharwar District as under :—

Serial No.	Brand No. of Bull.	Name of place.
1 ..	253	.. Hubli.
2 ..	236	.. Bijapur.
3 ..	260	.. Hulkoti.
4 ..	241	.. Hiremagdur.
5 ..	247	.. Aladkatti.
6 ..	246	.. Guledgud.
7 ..	251	.. Kudal.
8 ..	242	.. Kanchargatti.
9 ..	249	.. Kodiyal.
10 ..	272	.. Akkur.
11 ..	266	.. Ganajur.
12 ..	259	.. Kodiyal.
13 ..	261	.. Kolur.

Besides, 51 animals were sold realising a sum of Rs. 2,919.

Silage and Hay making.—The grass lands as pointed out above, had a very favourable season. The total quantity of green grass cut was 319,175 lbs. as against 232,130 lbs. of the last year. Of this quantity 107,455 lbs. of grass was ensilaged and the remaining quantity of 215,320 lbs of grass was fed to the cattle in stalls. An area of about 13 acres of the grass lands was reserved for hay making and the total quantity of hay made was 25,872 lbs. at a cost of Rs. 46-12-6 i.e., Rs. 1-10-4 per 1,000 lbs. Silage was also made from about cultivated fodder crops as under :—

	Lbs.
(1) Maize and Chavli	233,853
(2) Jowar	55,726
(3) Ragi	37,966
(4) Soya-bean	62,897
(5) Elephanta grass	4,485

Diseases and Deaths.—Foot and Mouth disease appeared on the farm in December and lasted for 20 days. There was no casuality. There were no other epidemics of any kind on the farm. Preventive inoculations against H. S. and Black Quarters were carried out during the year as usual. There were seven deaths due to old age, accident, pneumonia, etc.

Cultivation of Fodder Crops.—The total area under cultivation is 30 acres which is divided into 10 plots. The total cropped area during the year was 46 acres, 10 gunthas. The average and yields of different fodder crops grown on the farm together with the cost production per acre are shown in appendix IV attached herewith.

GOVERNMENT CENTRAL POULTRY FARM, KIRKEE.

Personnel.—Mr. V. C. Charanti was the Manager of the Farm throughout the year. Owing to the increase of the work, the post of the Assistant Manager was continued during the year.

Strength of the flock.—There were 821 birds on 30th June 1939 against 332 of the last year. Fresh blood was introduced in the Farm stock by importing birds during the year under report at a total cost of Rs. 690.

2 White Leghorn Cockerels.
2 White Leghorn Pullets.
2 Rhode Island Red Cockerels.
2 Rhode Island Red Pullets.
1 White Wyandotte Cockerel.
2 White Wyandotte Pullets.
1 Australorp Cockerel.
2 Australorp Pullets.
1 Black Minorca Cockerel.

15

The total mortality during the year was 71 Chickens, and 57 adult birds mostly due to minor ailments.

Testing Pen Record.—18 White Leghorn, 9 Rhode Island Red and 9 Australorp pullets were selected for testing the egg laying capacity in the testing pens. White Wyandotte Pullets could not be tested as number of White Wyandotte chicks are hatched and reared this year from the imported stock. Good pullets will be selected for trying in the testing pens in the ensuing year. The testing pen records of the above three breeds were 193, 166 and 151 eggs per year per bird respectively. (*vide* Appendix V appended herewith).

Incubation.—Artificial incubation was started on 12th August 1939 and ended on 15th May 1939. During this period 1,090 chicks were hatched, the hatching percentage of artificial incubation during the year under report was 77·45 against 77·37 of the last year. The average cost of hatching a chicken was anna one and pies ·07. (please *vide* Appendices VI and VII).

Supply of Birds for Breeding purposes.—354 birds were sold to the cultivators at concession rates for Rs. 908-0-0 and 156 birds were sold to rich people at full rates for Rs. 1,032-8-0 during the year under report.

637 setting eggs were sold at concession rates to the farmers for Rs. 162-4-0 and 303 setting eggs at full rates to the well-to-do people for Rs. 188-1-9 were sold during the year under report.

Poultry Training.—The District School Boards in the Southern Division deputed four teachers for the practical poultry training class, one from each district during the year under report. 76 students were admitted for Poultry Training at the Government Central Poultry Farm, Kirkee, during the year under report. Out of these, 57 students completed the full Short Course. Four of the best students were awarded the four cash prizes worth Rs. 50, Rs. 40, Rs. 30 and Rs. 20 according to their merits.

Rural Uplift Work.

Improvement of the Buffalo in the Province.—The Scheme for the improvement of the milch buffalo was amalgamated with the general work of this section as reported in the last year. In the middle of the year, the work of testing of buffaloes for their milk-yield has been stopped as per Government orders.

In Gujerat 99 buffaloes were tested in three villages of Anand taluka, of these 39 finished their lactation during the year, 10 were sold and 50 were still milking. Eight buffaloes yielded 3,500 lbs. of milk in a lactation and 31 buffaloes 5,500 lbs. of milk and over, thus showing the excellent care taken of the buffaloes.

In Khandesh 77 buffaloes were tested for their milk-yield during the year. Out of these 20 buffaloes finished their lactation during the year, 5 buffaloes yielded milk less than 3,500 lbs. and 15 buffaloes 3,500 lbs. and over.

In Karnatak 95 buffaloes were tested. Of these 32 buffaloes yielded milk less than 3,500 lbs. and 63 buffaloes over 3,500 lbs. During the year 10 buffalo breeding bulls were put out in the district for the improvement of the milch buffaloes. There were 13 buffalo-bulls on hand at the end of the year and it has been decided to put them out at Rs. 25 per bull without maintenance charges.

A Scheme for supply of 12 young male pedigree buffaloes from the Agricultural College Dairy, Kirkee, free of charge to cultivators in Gujerat for rearing and utilising them for breeding purposes at a total cost of Rs. 240 per year has been sanctioned by Government during the year.

Propaganda in storage and cultivation of fodder.—Silage making demonstrations were carried out in 7 villages—5 villages in Thana District and 2 in Kolaba District during the year under report. As regards the cultivation of fodder, many inquiries were received for growing of Lucerne in East Khandesh on Wells. Two hundred pounds of Lucerene seed was made available during the year.

The Director of Agriculture, Mysore, supplied three pounds of dry napier grass and experiments in growing the same on "Mal" tracts of the Bombay Province have been undertaken recently at five places. The results of trial would be reported next year.

Formation of Milk Recording Societies.—(As an aid to developing high milk yielding strains of the more important Indian breed of cattle): Pedigree Registration and Milk Recording have exercised profound influence on the improvement of Livestock in all countries of the world where livestock wealth has been augmented. During the year, the Imperial Council of Agricultural Research sanctioned a scheme of milk recording by granting Rs. 960 per year for a period of 2 years on equal contribution from this Province. Milk recording has been undertaken in June 1939 in 6 villages of Sanad Taluka of Ahmedabad District where the work or improvement of Kankrej cattle has been going on since the last 20 years, by means of the Premium Bull System.

Poultry Improvement Schemes.

There are two Schemes for the improvement of Poultry in the villages. One is mainly directed towards improvement of Poultry in villages and the other is called the Poultry Premium Scheme.

Scheme I—*Improvement of Poultry in Villages.*—This scheme aims at improving the laying qualities, the size, the colour and the general performance of the country flock by introducing pure blood. The cockerels (ready for use) of improved pure breeds of fowls acclimatized in India and noted for their egg laying qualities are selected to be distributed free among the villagers who keep country fowls and are interested in Poultry Farming.

During the year under report, two hundred and seventy (270) cockerels were put out in various Districts. Out of these, 207 were White Leghorns, 23 Black Minorca, 23 Rhode Island Red, 7 Australorp, 6 Light Sussex and 4 Indian Runner Drakes. So far we have taken over 90 villages for our Poultry Improvement work.

In most parts of the Bombay Province, the hatching season commences from October and ends by April every year. The pure-bred cocks are put out before or during the hatching season. The grades have given all White colour of White Leghorn and Black colour of Black Minorca, and Red colour of Rhode Island Red. In most villages, the graded pullets are laying and laying larger eggs than their dams. The number of eggs per graded pullet has also increased. This marked increase in the size, weight, texture and number of eggs laid by the graded flock has convinced the farmers more than ever the useful purpose served by this type of improvement. Further progress, however, requires local help and adequate staff.

The diseases commonly found in villages are Ranikhet, Fowl Cholera, Tick Fever and Diarrhœa. Some villagers, who have understood the principle of seggregation, isolate their healthy stock and remove them to the fields outside. Broody hens purchased in local bazaars usually spread disease. Our work is much hindered by these deadly diseases among the fowl population. The poultry farmers who used to take keen interest in spreading this side industry in the beginning are disappointed due to the sudden and repeated outbreaks of epidemic which wipe off all their efforts in improving their village poultry stock. It is, therefore, very essential to carry out investigation and consequent legislation to put a stop to the spread of poultry diseases.

SCHEME II—*Scheme for the encouragement of pedigree poultry keeping in villages by grant of premia to poultry farmers for maintaining poultry farms.*—The idea underlying this scheme is to popularise poultry keeping on up-to-date lines among intelligent poultry farmers. Two types of cash premia are given—one for housing of Rs. 100 each, and the other the fertile egg and fowl premium of Rs. 75 each.

Eight poultry farmers were awarded poultry premia during the year under report. Messrs. D. M. Sabnis of Turkewadi and B. L. Patil of Kanbargi from Belgaum District suffered losses due to heavy mortality among their fowls. The remaining poultry premium holders did well during the last year.

District Poultry Centre Scheme.—This scheme is being worked in Kaira, Thana, Kolaba, East Khandesh and Sholapur Districts. This is financed from the Village Improvement grants placed at the disposal of the various Collectors. This scheme aims at improving the Village Poultry of the District by running a small poultry farm and distributing pure-bred stock to the villagers round the centre. Five small poultry farms are established one in each of Kaira, Kolaba and Thana Districts and two in Sholapur District. All these farms are found doing very useful work. We have distributed 20 Poultry houses, 45 White Leghorn

Cockerels and 100 setting eggs to the various cultivators of East Khandesh from the District Village Improvement funds placed at our disposal by the Collector of East Khandesh.

Egg Marketing Scheme, Belgaum.—This scheme is financed from the Sir Sassoon David Trust Fund, and was started at Belgaum on 18th November 1938 under the guidance of Rao Saheb V. V. Shirgaonkar, B.Ag., about 21,350 eggs were handled during the period ending 30th June 1939.

Percentage of bad eggs to good eggs was very low. It was not possible to candle eggs at the producers' door when they were collected. Percentage of different grades of eggs collected shows that the eggs collected from people who pay special attention to their poultry and market their eggs fresh, are good and come under the class Special A and B. The major portion of C and D class eggs were collected from cultivators who do not pay special attention to poultry.

The Infants and Public Milk Supply Company Limited, Palghar.

This Company is carrying on with the various improvements suggested to them. They have and are having a bad time with contagious abortion. I am afraid, this disease has been imported on to the farm by stock they purchased in Bombay, which were stock originally from Bombay City taken back into the Mofussil and then brought back to Bombay whilst in calf, these aborted when taken to Palghar. The Company now is purchasing stock themselves in Gujerat.

The strength of the herd was 381 as against 425 of the previous year, the decrease being due to weeding out of uneconomical animals and mortality. The farm lost 167 animals during the year due to H.S., and Anthrax. Besides these there were 49 cases of abortions. The Company produced 463,447 lbs. of milk during the year and supplied the city of Bombay with 451,137 lbs. of milk.

The area of 350 acres for hay making produced 1,119,250 lbs. of hay as against 817,000 lbs. for the previous year. The increase in yield is due to the effective prevention of outside cattle by means of fencing and also to clearing of the bushes. During the year under report a circular silo pit 24 feet in diameter and 16′ deep with 15″ of cement concrete sides and bottom was constructed at a total cost of Rs. 900. The silo has the capacity to hold 1½ lacs lbs. of green fodder. It has recommended to the Company to build another silo pit for the supply of succulent fodder and to purchase as many fresh buffaloes and cows as possible so that the cost of production of milk may be reduced and more milk supplied to Bombay City.

The Bombay Gowrakshak Mandali.

In the annals of the history of the Bombay Gowrakshak Mandal, the year under report would rank as one of the most famous and

conspicuous periods. The Mandali celebrated its "Golden Jubilee" on 23rd January 1939 and organised a big Cattle Show at Kandivlee, which was opened by His Excellency the Viceroy Lord Linlithgow. The Viceroy was accompanied by His Excellency the Governor of Bombay. Among the notable guests were the Honourable Mr. A. B. Latthe, Finance Minister, and the Honourable Mr. Morarji R. Desai, Revenue Minister, to the Government of Bombay.

The party was received by the President of the Mandali, Sir Purushottamdas Thakurdas. The Livestock Expert to Government (Mr. E. J. Bruen) took the party round the Show.

Welcoming His Excellency the Viceroy and the guests, Sir Purushottam Thakurdas gave a history of the activities of the Mandali. He said that the poineers of the institution were amongst the farsighted stalwarts of Bombay, who more than 50 years ago utilised the attachment of the Hindu for the cow for improving the breed of milch cattle. In that work of improving the breed of cattle, the Mandali acknowledged with great pleasure the continued guidance and assistance it had received from the Government of Bombay and particularly the whole-hearted co-operation it had consistently received from Mr. Bruen, the Livestock Expert of the Government of Bombay.

The Mandali had during the last half a century spent about Rs. 19 lacs in all its efforts to carry out the aims and objects laid down in its original Trust Deed. Cattle Breeding was a matter which required a great deal of faith and business courage, as it took a long time before tangible results were available. We feel that a great responsibility lies on the shoulders of those who value cattle from any point of view, either religious or sentimental, to expand their scope in such a way that the general level of cattle wealth is increased.

In the conclusion, Sir, Purshottamdas requested the Viceroy, as President and Founder of the All-India Cattle Show to accept from the Mandali a shield to be known as "The Bombay Gowrakshak Mandali Golden Jubilee Challenge Shield". After distributing the prizes, the Viceroy in addressing the gathering said; "Let me say that I have been most interested by all that I have seen this afternoon and also that I heartily endorse the aim of this Mandali to divert the strong sentimental sympathy for cattle preservation into useful and constructive channels. I note too with satisfaction that when I appealed for more efforts at improving the breeding of cattle this Mandali was the first to have the necessary bulls to give to people for cattle breeding. In this connection let me congratulate the Mandali on the improvement which its figures show in the milk yield of its herd and the general improvement in its cattle. This is a matter for considerable satisfaction. I am gratified to hear the acknowledgment of the guidance and assistance which you have received from the Government of Bombay and particularly from its experts. I trust that this close co-operation will continue as it can produce nothing but beneficient results".

In conclusion, let me thank you for your kind words regarding my own interest in the cattle problem of India, let me congratulate all those who have won prizes and medals this afternoon, rewards won for work such as this are, let me assure you, well worth winning and finally let me wish the Mandali a long life of useful activity.

The Bombay Gowrakshak Mandali has two farms—one at Kandivlee and the other at Betegaon. The milking stock is kept at Kandivlee while the growing and the dry stock are kept at Betegaon.

Mr. K. K. Shukla, B.Ag., was the Manager for the whole year.

Livestock.—A superior herd of Gir cattle is being developed on the farm. The number of pure bred Gir cattle was 153 at the end of the year as against 170 at the beginning. The decrease was due to donating 12 Gir cows to the Nandurbar Panjarapole in Khandesh for breeding purposes. During the year 19 heifers came into milk as against 8 in the previous year; out of these 19, two heifers calved before the age of 3 years; 4 before the age of 4 years; 6 before the age of 4¼ years and 7 between 4½ to 4¾ years. The average age at first calving works out 4 years and 1 month. The minimum and maximum ages of first calving were 2 years, 9 months, 18 days and 4 years, 7 months, and 24 days respectively.

During the year 12 cows milked more than 4,000 lbs. in a lactation as against 18 in the previous year. One outstanding cow "Nandini" gave 7,941 lbs. of milk in 509 days. The following table compares the milk yield of the cows with that of the previous year:—

Year.	Cows.		Total Cows.	Total milk yield in lbs.	Annual average milk yield per cow including dry in lbs.
	In milk	Dry.			
1937-38	45	32	77	*176,009	*2,286
1938-39	46	33	79	*179,983	*2,276

*Exclusive of milk suckled by calves.

The milk is supplied to different Hospitals, Welfare Centres and the Government Physical Training Institute at Kandivlee.

Breeding Bulls.—During the year 11 breeding bulls were placed out for cattle improvement in the districts as against 15 in the previous year. There are 20 breeding bulls on the farm ready for placing out in the districts for cattle improvement.

Fodder Production and Hay-making.—The area under fodder crops was 31 acres in all—26 acres at Betegaon and 5 acres at Kandivlee—producing 8 lac pounds of green fodder. The yields of fodder per acre are shown below :—

Name of fodder.	Yield of green fodder in lbs. per acre.
Jowar	21,760
Maize	19,792
Oats	16,757
Lucerne	28,973
Carrots	30,400
Chavli	15,392
Wal	12,769
Elephanta grass	41,725
Guinea grass	50,128

During the year 7 acres of the new land was opened at Kandivlee for growing of fodder crops. 20 lac pounds of hay was made during the year as against 18 lacs pounds last year.

General.—The meritorious part played by the Honorary Joint Secretaries of the Bombay Gowrakshak Mandali (1) Shet Harjivan Walji and (2) Shet Haridas Morarji Velji in organising successfully the Golden Jubilee Cattle Show deserve high praise. Similarly Mr. Nanalal Tribhuwandas Tarkas—office Manager of the Mandali spared no troubles in making the Show successful.

Taluka Development Association Cattle Breeding Farms.

1. The Pimple Cattle Breeding Farms for the Nimar Breed, run by the Taluka Development Association, Jalgaon, East Khandesh, has been making a steady progress. There were 138 head of Nimar cattle on the farm at the end of the year consisting of 50 cows; 46 heifers and female calves, 40 male calves and young bulls and two breeding bulls. There were 27 male and 14 female calves born during the year. Five male and five female calves died during the year due to minor diseases. The farm supplied 12 breeding bulls during the year at a total cost of Rs. 1,650. 43 cows were milked during the year, producing 13,463 lbs. of milk. "The milk produced was from two teats, leaving the remaining teats for suckling of the calves." The milk was supplied to Jalgaon town and fetched Rs. 994. The farm is leasing out 80 acres of land at Rs. 300 per year for growing of crops. About $\frac{2}{3}$rd of the area was under fodder crops and $\frac{1}{3}$rd under groundnut and cotton. Besides, the farm has been given an area of 403 acres of good grass lands at a lease of Re. 1 per acre. About $\frac{1}{3}$rd of the area is used for grazing and the remaining $\frac{2}{3}$rd is reserved for hay and silage making. The Jamnapari goats on the farm have not fared well on the farm. The whole herd was affected by skin disease to which it finally succumbed.

The farm is also maintaining a poultry farm. During the year 46 White Leghorn Cocks and 2,000 eggs for hatching were supplied. The farm sent 2 breeding bulls, 4 cows and 2 heifers to the 2nd All India Cattle Show at Delhi and won all 1st prizes for bulls, cows and heifers plus a cash of Rs. 395. During the year the farm received Rs. 1,500 from the District Local Board, East Khandesh, and Rs. 1,000 from the Central Co-operative Bank as help. The authorities of the Taluka Development Association, Jalgaon, are to be congratulated in running the farm ably.

The Gangapuri Cattle Breeding Farm, Jamner.

2. The Gangapuri Cattle Breeding Farm managed by the Taluka Development Association, Jamner, East Khandesh, is also working with the Nimar breed. The farm had 22 cows, 21 heifers and female calves, 22 young bulls and male calves and 3 breeding bulls. There were 5 male and 8 female calves born during the year. The farm supplied one breeding bull during the year for the Gift Bull Scheme.

The farm is handicapped in disposing of its milk due to the road not accessible throughout the year. The Farm is situated 7 miles from Jamber town and there is river in between. Accordingly only 4 Nimar cows were milked during the year. The farm brought under cultivation an area of 71 acres for growing of fodder crops. The land is, however, very poor and it produced on an average 1,000 lbs. of dry fodder per acre.

During the year under report Government sanctioned the lease of 150 acres of grazing land to the farm for a period of 4 years at the concession rate of rupee one per acre on condition of development of the land by systematic treatment of rotational grazing and silage making under the guidance of the Livestock Expert.

The Sangvi Cattle Breeding Farm.

3. The Sangvi Cattle Breeding Farm has been closed during the year.

Scheme for Research in Poultry Husbandry Financed by the Imperial Council of Agricultural Research.

The Scheme is working at the following three centres :—

(1) Kirkee Centre in the Poona District under the Livestock Expert to Government, Bombay Province, Poona.

(2) Vadala Centre in the Ahmednagar District under Rev. R. W. Fairbanks, American Marathi Mission.

(3) Ankleshwar Centre in the Broach District under Rev. D. J. Lichty, Principal Vocational Training School, Ankelshwar.

The above three Centres are under the supervision of the Livestock Expert to Government, Bombay Province, Poona, and the work done during the year at these centres is described in brief below :—

KIRKEE CENTRE.

I. *Strength of the Farm.*—There were 664 birds on 30th June 1939 as against 448 of the previous year.

Fresh blood was introduced for the first time in the farm stock by importing the following cockerels during the year under report :—

	Rs.	a.	p.
1. White Leghorn Cockerels—2 costing ..	131	9	0
2. Rhode Island Red Cockelers—2 costing ..	131	9	0
3. Light Sussex Cockerel—1 costing ..	65	12	0
Total amount ..	328	14	0

All the imported cockerels did very well except one Rhode Island Red Cockerel which died of leg weakness lingering over a long period in spite of all precautions.

II. *Disease of the Farm.*—There was no contagious disease on the farm during the year under report. The total mortality from various diseases was 170–113 chickens and 57 adult birds.

III. *Testing the laying capacity and size of eggs of different breeds of poultry.*—This was continued as last year by trapnesting the egg record of the following breeds as shown below :—

Name of Breed.	Number of birds.	Number of eggs laid in months.	Total weight of eggs in ozs.	Average number of eggs per bird.	Average weight of eggs, ozs.
		Months.			
Chittagong ..	2	167 (12)	239 $\frac{7}{8}$	83·50	1·43
Naked Neck ..	7	702 (12)	910 $\frac{3}{8}$	100	1·15
Khaki Cambell ..	4	555 (11)	1,191 $\frac{1}{4}$	151·36	2·14
Naked Neck × White Leghorn	2	301 (10)	493 $\frac{3}{16}$	150·5	1·63
Indian Runner ..	7	305 (11)	666 $\frac{3}{4}$	43·5	2·18

IV. *Incubation.*—Artificial hatching was conducted for the whole year to study the best hatching season. Monsoon hatching was found satisfactory, but the rearing of chickens was found to be troublesome in the heavy rains. The question of rearing chickens artificially in the rainy season will be taken up for study shortly.

The number of chicks hatched during the year under report was 721 against 758 chicks of the last year.

Experiment No. 1.

V. *Feeding Experiments—Wheat Bran feeding* versus *Rice Bran feeding*—The object of this experiment was to study the nutritive value of Rice Bran in comparison with Wheat Bran. Rice Bran is much cheaper than Wheat Bran which is not fed to the poultry in the villages. Equal number of ducklings of the same age and breed were kept for experiment. The breeds chosen for the experiment were (1) the Country and (2) the Indian Runners. The above experiment lasted for 62 days in the first instance. The ducklings kept on rice bran grew very weak and unthrifty. Almost all ducklings of this lot got the nutritional roup. It was very much surprising to notice that the Indian Runner Ducklings of this lot completely lost their breed appearance.

While the lot kept on wheat bran did well. Not a single duckling suffered from the Nutritional disease. The experiment was reversed to confirm the result.

Experiment No. 2.

Wheat Bran mash feeding versus *Ashi Bran mash feeding.*—This experiment was conducted with a view to study whether Ashi bran can be substituted for wheat bran. The Ashi bran (finer rice bran) is easily available in heavy rainfall tracts and is very cheap. The breed selected for the experiment was Rhode Island Red. The experiment was conducted for 60 days in the beginning. All the grains fed to both the lots were common such as Wheat, Jowar, broken maize, bajri, etc. Green feeding was common for both the lots. With all these the lot kept on Wheat bran mash appeared to be better than Ashi bran mash. The experiment was reversed twice to confirm the result. The result go to show that the lot kept on Ashi bran mash proved to be poor layers.

Experiment No. 3.

"Nagli" grain feeding versus *"Bajri" grain feeding with standard mash common.*—The intention of conducting this experiment was that Nagli is commonly grown in the rainy tract and is one of the staple foods of the people and the poultry. Bajri is not grown there. Nagli grain was fed to birds as it was (without being crushed). We noticed that some grains were passing in the excreta of birds without being properly digested. Bajri grain was fed in the same manner; but not a single grain could be traced in the excreta of the birds. This shows that birds digest Bajri better than Nagli. It was also noticed that there was much refuse of Nagli grain than Bajri grain while feeding the birds every day. White Leghorn pullets were selected for the purpose. The Nagli grains were then crushed and fed to birds; but Bajri was fed as it was. Many broken pieces of Nagli even then could be found in the excreta of birds. The experiment was reversed twice to confirm the results. It was proved that Nagli feeding was not satisfactory compared to Bajri feeding.

VI. *Observations of the different breed characteristics of poultry and their behaviour.*—Observations on the habits and behaviour of various breeds of poultry were recorded as last year. These are summarised below :—

Light Sussex Breed.—Flock average record of the farm bred hens was maintained to study the egg laying capacity of this breed. The average laying capacity of the breed in question was 175·68 eggs per hen per year and the average size of the egg was 1·90 Ozs. as against 152·20 eggs per hen per year and the average size of the egg 1·96 oz., of the previous year. The average size of the egg of this breed this year has gone down a little, but the number of eggs per bird has increased satisfactorily. Trap-nesting record will be maintained to ascertain the best layers in the next year. The Light Sussex hens go into a heavy moulting in the month of July. Tincture of iodine is added in the drinking water to help the moulting of the birds. The imported Light Sussex Cockerel gave a very satisfactory service during the Breeding season.

Eighty-seven Light Sussex chicks were hatched during this year. The chickens grew very rapidly without any trouble. There was less mortality in these chicks. We found them very easy to rear on our Farm.

White Leghorn and Rhode Island Red.—Trap-nesting records were maintained to ascertain the laying capacity. The average laying capacity of both the breeds was very lowered due to inbreeding. 2 White Leghorn and 2 Rhode Island Red Cockerels were imported this year to introduce new blood. 346 White Leghorn and 137 Rhode Island Red Chicks were hatched during the year under report. The chicks hatched from the imported parents have been punch-marked and wing-banded to distinguish the pedigree records. The stock raised this year is extremely good. The demand for Rhode Island Reds both from cultivators and fanciers was so great that we were unable to meet the demand. Cultivators seem to be in favour of the Rhode Island Reds. Rigid selection will be made in the next year by means of trap-nesting taking into consideration the standard size of egg production.

Chittagong as in indigenous breed.—This is the second year of this breed on the Farm. A Trap-nesting record was maintained to ascertain the best layers. The average egg record per year is 83·5. One trio of Chittagong was purchased from Bengal at a cost of Rs. 13 with the help of the Livestock Expert to Government, Bengal Province, Dacca. These birds in the beginning looked more or less like White Leghorn but subsequently their white plumage changed into light brown. Now they resemble Aseel birds in appearance. It is noted that Chittagong birds are tight feathered, active and very hardy. They make very good table birds. This breed does very well on free range.

Chitt-Rhode Breed.—(A new cross) Attempts were made to see whether it could be possible to evolve a new breed by crossing the Chittagong hens X Rhode Island Cock and to study their egg laying capacity

and meat production. Chicks were hatched and reared to maturity very successfully. The colour of the chickens in the first generation is of light red with the tips of the tail grey and they are growing well. The cockerels are extremely beautiful, stout and sturdy. The feathering in the offsprings is decidedly better than Rhode Island Reds. The chickens grow quicker than Rhode Island Red chickens. The shape of Chitt-Rhode chickens resembles their mothers (Chittagong). The size of the body is much improved in both the pullets and cockerels. The egg laying capacity is under observation. Flock average records are maintained for the purpose.

Naked-Neck as an indigenous breed.—This is the second year of this breed on this farm. They did not suffer from any disease. They were found to be hardier than all the other breeds kept on the farm. The trap-nesting record of this breed for complete 12 months was maintained.

The average laying capacity of this breeding is 100 and is better than Chittagong but the size of the egg is rather small. Rigid selection in the new pullets of this breed is carefully done for the purpose of breeding them true to type, colour etc. Buff and light coloured pullets are selected for trap-nesting purpose.

Cross between the Naked-Neck hens X White Leghorn Cock.—This cross has done well in all respects. The trap-nesting record of the pullets of the first generation was maintained for 10 months. The colour of the offsprings is nearly all white. But it is further found that even in the second generation the covered-neck chicks could be seen. Observation of the presence of covered-neck chicks in the third generation will be continued. The broodiness in the first and the second generations is not completely wiped out.

Khaki Cambell Duck Breed.—At the time of hatching it was observed that many eggs were infertile, and consequently sufficient number of ducklings could not be hatched. This may be due to inbreeding. Many attempts were made to get fresh blood from other farms in India but to no purpose.

Fresh blood in this breed is also essential to improve the farm stock. Sufficient number of duckling could not be hatched as the setting eggs were found mostly infertile. The Indian Runner Ducks are laying big size of eggs although they are small in body-size. Many Indian Runner drakes were sent out in the villages for improving the village stock of ducks. Village Duck keepers are now realising the importance of the above two breeds of ducks.

VII. *Testing the suitability of cheap poultry houses constructed from easily available materials in villages* :—The mud house constructed on 12th September 1937 gave a satisfactory service this year also. The roofing made of toddy palm leaves was completely spoiled. It was replaced with sugar cane trash during the year under report. The inner and outer

walls of this house were tarred and white-washed twice during the year to prevent ticks and other vermins. Some petty repairs were executed. This house remained free from ticks this year also. This type of house can be advocated in the villages as it is cheap and economic.

The poultry house made of aloes leaves in the last year remained serviceable this year also. The dried aloe leaves had to be removed and replaced with fresh leaves three times in the year especially during the summer time. No fowl ticks were noticed in this house. Occasional disinfection was carried out in this house to prevent contagious diseases. This type of house is only recommended to be constructed having wire-netting on all sides of the house to keep out enemies of poultry, like wild cats, dogs, foxes, mongoos etc., etc.

VIII. *Supply of Pedigree birds.*—During the year under report, 171 birds (hens and cocks) and 11 ducks were put out in villages of the Bombay Province, and Native States for breeding purposes.

IX. Supply of Setting Eggs.—238 Setting eggs (238 fowl-class only) amounting to Rs. 53-8-0 were supplied to the farmers at concession rates and 54 setting eggs (54 fowl-class only) costing Rs. 32-6-3 were sold to the rich people at full rates during the year under report.

Imperial Council of Agricultural Research Poultry Research Scheme.

Ankleshwar Centre: —(Broach District).

I. *Feeding Experiment.*—Complete ration, including animal protein Vs. an all grain ration. The latter was intended to approximate as nearly as possible the feed the fowls would ordinarily have if kept under village conditions except that mixed grain was provided in suffcient quantity.

Purpose.—To test the two systems of feeding as to cost, general health and maturity of birds.

Procedure.—On January 1st 1939, two lots of Rhode Island Red Chicks just out of the shell and having an heritage as nearly equal as possible were selected. Each lot was kept in a yard measuring 10 x 15 feet. Water, minerals, fresh sand, gravel and medicines needed were supplied to both lots.

Feeding.—Lot No. 1 received a cracked grain mixture as follows :—

Wheat	..	..	..	1 Part
Jowari	..	..	..	3 Parts
Millet	..	..	..	1 Part

The following mash mixture was also fed.

Ground wheat	.. .. ..	2 Parts
Ground Jowari	.. .. ..	5 Parts
Ground Millet	.. .. ..	1 Part
Ground Gram	.. .. ..	¼ Part
Rice Bran	.. .. ..	1 Part
Wheat Bran	.. .. ..	1 Part
Dried fish	.. .. ..	1 Part (powdered).

Skim milk, either sour or sweet was used once a day, at noon for mixing the mash feed.

Green feed in the form of onions, alfalfa and " Tanduli Baji " etc. was given daily at 10 a.m.

Lot No. 2.—Received only a grain mixture as follows :—

Wheat	.. .. ..	1 Part
Jowari	.. .. ..	3 Parts
Millet	.. .. ..	1 Part

The grain cracked, was fed morning and evening. At noon the same grains ground, were fed in the form of a mash. A limited amount of green feed was allowed at 10 a.m. when the fowls were not allowed to range outside the yard.

Results.—The fowls were weighed regularly and their general condition was observed from time to time. By the end of one month the superior condition and appearance was noticeable in Lot No. 1. The difference became more apparent as the experiment proceeded.

Tabulated results.

Lot number.	Average weight on May 31st.	Average total feed cost from January 1st to May 31st.	Feed cost per pound of grain.
		Rs. a. p.	Rs. a. p.
1.	2 1/16 lbs.	0 8 2	0 3 0
2	1 lb.	0 5 3¼	0 5 3¼

A similar experiment with two lots of country hens was carried on from October 1st to March 31st with the following tabulated results:—

Lot No.	Average weight at the end of the experiment.	Average monthly cost per hen for feed.	Average number of egg per hen per month.
		Rs. a. p.	
1.	2 lbs. 12$\frac{3}{5}$ozs.	0 3 8$\frac{1}{2}$	7$\frac{2}{3}$
2.	2 „ 9$\frac{4}{5}$ „	0 2 10$\frac{1}{2}$	6$\frac{1}{3}$

The following table will show the comparative results of feeding the Grain-Protein ration to Rhode Island Reds, White Leghorns and to the Country fowls, as from January 1st to May 31st :—

Breed.	Average weight on 31st May.	Average feed cost per hen for the period of experiment.	Feed cost per pound of gain.
		Rs. a. p.	Rs. a. p.
Rhode Island Red	2$\frac{13}{15}$ lbs.	0 8 2	0 3 0
White Leghorn	1 lb.	0 7 5	0 5 4
Country	1 lb. and 12$\frac{7}{16}$ozs.	0 8 6$\frac{1}{2}$	0 5 0

II. *Selective Breeding.*—There was no disease to interfere in the keeping of complete records of pedigrees previously opened. Trap-nest records were kept for all hens during the year. Using these records as a basis, eggs for hatching were selected.

Breeding will continue throughout the current year for the purpose of—

(1) maintaining or improving breed characteristics and productivity in the Rhode Island Red and White Leghorn breeds. At the opening of the new breeding season a pedigreed Rhode Island Red Cock and an unpedigreed White Leghorn Cock will be available to introduce into the proper flocks. The Rhode Island Reds of the third and fourth generations are not true to type as to colour. At the age of 6 months there is a very noticeable sprinkling of white feathers which spoil the appearance of the fowls. Possibly there will be an improvement by the introduction of the new cock;

(2) trying to increase the size and productivity of both fowls and eggs of the *Country Selection*. The third generation of this breed are heavier in weight and tend to a uniform colour of light grey.

III. *Egg Production.*—July 1st 1938—June 30th 1939 :—

Breed.	Average number of eggs per hen per month.	Average weight of all eggs produced.
Rhode Island Red	10	2⅛ ozs.
White Leghorn	13	2 1/16 „
Country	7⅝	1⅜ oz.

Highest Records : July 1st 1938—March 31st 1939 :—

Breed.	Total number of eggs.	Average weight of eggs.	Total weight of eggs.
Rhode Island Red	111	2 oz.	13 lbs. 4 ozs.
White Leghorn	132	2⅛ „	17 „ 8½ „
Country	70	1¼ „	7 „ 10½ „

IV. *Cost of Production.*—Table showing profit or loss from July 1st, 1938 to March 31st, 1939 on the basis of food and medicine :—

Breed.	Total average of eggs per hen.	Average feed cost per month per hen.	Total feed cost per hen for period of experiment.	Value of eggs per hen.	Profit or loss per hen.
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Rhode Island Red..	90	0 5 6	3 1 7¼	6 9 0	3 7 4¼
White Leghorn ..	111	0 5 7½	3 2 8½	8 8 6	5 5 9½
Country ..	70	0 4 4¾	2 7 7¼	2 2 0	0 4 7½ (Loss).

V. *Incubation.*—The comparative result of monsoon and winter hatching is shown by the following table. All hatching was done in the incubators :—

Monsoon Season . .. August to October.
Winter Season .. .. November to January.

The record shows that Monsoon hatching was more successful than winter hatching. As compared with 1938 report the result appears to

be a bit more satisfactory. Yet many eggs turned out to be unfertile or else the germ or chick died in the shell. It is to be hoped that by the introduction of the new cocks better results will be obtained. It was noticeable that the White Leghorn eggs were less fertile than the Reds and Country breeds :—

Season.	Number of eggs.	Unfertile eggs.	Germ or Chick died in shell.	Number of chicks hatched.	Percentage.
Monsoon	71	27	11	33	75
Winter	66	25	15	26	63

Table showing cost of fuel and eggs per chick hatched :—

Season.	Kerosene cost per chick.	Cost of eggs at Rs. 2 per dozen.	Total cost per chick.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
Monsoon	0 2 8	0 5 9	0 8 5
Winter	0 2 8	0 6 9	0 9 5

The extra expenses as compared with the previous year is attributed to the use of a higher priced kerosene.

VI. *Housing and Yards.*—Nothing new in housing was undertaken during the year.

Two new yards were added making 19 in all.

Alfalfa was grown in one of the lots for several months of the year.

VII. *Disease and Pests.*—The fowls were quite free from lice and ticks. Early in 1939 a virulent type of Diptheric roup invaded the surrounding community but by proper precautions on the part of the working staff it did not gain a hold in our centre. We are also indebted to the local veterinary surgeon who innoculated all the fowls of the centre against the disease as well as a number of the fowls in the community.

Imperial Council of Agricultural Research, Poultry Research Scheme.

Vadala District (Ahmednagar District).

I. *Laying capacity and size of eggs* :—

Serial No.	Hen No.	Breed.	Total number of eggs laid.	Total weight eggs laid.	Average weight per egg.	1937-38 Record.	Remarks.
1	108	White Leghorn.	136	271·62	1·99	146	
2	116	Do. ..	122	240·25	1·96	134	
3	117	Do. ..	173	338·12	1·95	183	
4	165	Do. ...	149	294·37	1·98	185	
5	180	Do. ...	156	310·25	1·98	140	
6	183	Do. ..	107	210·24	1·96	157	
7	185	Do. ...	187	369·25	1·97	161	
8	195	Do. ...	175	337·12	1·92	146	
9	206	Do. ...	67	111·86	1·67	..	1938 Pullet.
10	208	Do. ..	182	336·12	1·84	..	Do.
11	209	Do. ..	109	204·24	1·87	..	Do.
12	210	Do. ...	145	240·49	1·66	..	Started, August 1938.
13	211	Do. ..	149	248·62	1·99	..	Do. do.
14	212	Do. ..	70	108·24	1·54	...	Do. do.
15	213	Do. ...	88	154·75	1·76	..	Do. November 1938.
16	214	Do. ..	133	212·24	1·59	..	Do. do.
17	215	Do. ..	152	260·74	1·71	...	Do. July 1938.
18	216	Do. ...	142	234·61	1·65	...	Do. August 1939.
19	217	Do. ..	27	45·12	1·67	...	Do. October 1938.
20	218	Do. ...	118	184·75	1·56	..	Do. do.
21	14	Light Sussex.	90	168·50	1·87	...	Do. November 1938.
22	15	Do. ...	36	66·74	1·85	...	Do. do.
23	17	Do. ...	28	55·75	1·99	...	Do. December 1938.
24	18	Do. ...	34	67·37	1·98	...	Do. January 1939.
25	51	White Chhittagong.	23	32·25	1·40	...	Do. do.

Serial No.	Hen No.	Breed	Total number of eggs laid.	Total weight Eggs laid.	Average weight per egg.	1937-38 Record.	Remarks
26	52	Chhittagaon	35	55·77	1·59	..	Started January 1939.
27	748	White Leghorn	47	76·62	1·63	..	Do. do.
28	749	Do. ..	36	59·42	1·67	..	Do. do.
29	750	Do. ..	52	95·11	1·83	..	Do. do.
30	751	Do. ..	28	45·24	1·61	..	Do. February 1939.
31	752	Do. ..	42	61·99	1·47	..	Do. January 1939.
32	754	Do. ..	41	72·62	1·77	..	Do. February 1939.
33	755	Do. ..	13	19·12	1·39	..	Do. January 1939.
34	756	Do. ..	21	29·62	1·36	..	Do. February 1939.
35	759	Do. ..	28	47·5	1·69	..	Do. do.
36	761	Do. ..	31	49·39	1·59	..	Do. do.
37	745	Do. ..	8	11·49	1·43	..	Do. March 1939.
38	764	Do. ..	13	19·87	1·53	..	Do. do.
39	792	Do. ..	7	10·62	1·52	..	Do. do.
40	757	Do. ..	11	15·86	1·44	..	Do. do.
41	771	Do. ..	3	4·37	1·46	..	Do. do.
42	747	Do. ..	3	4·62	1·54	..	Do. do.

Flock Average: 16 birds laying from July and August 1938 .. .. 138·81
Flock Average: 1937-38 .. .. 129·70
Flock Average: 1936-37 .. .. 127·60

II. The flock has been raised entirely on scratch and dry mash ration. Ground bone or jhingi has been included in the mash. Luncerne grass and butter-milk is given daily.

Cost of Feeding :—Rs. 0-5-9 per bird per month.

III. *Incubation : (A) Statement showing cost of hatching chicks.*

Number of setting eggs issued for hatching.	Cost of setting eggs at Rs. 3 per dozen.	Kerosine oil incubator lbs.	Cost of kerosene oil.	Number of chicks hatched.	Cost of hatching chick including cost of eggs.	Average cost of hatching each chick.
1	2	3	4	5	6	7
	Rs. a. p.		Rs. a. p.		Rs. a. p.	Rs. a. p.
321 ..	80 4 0	352	34 6 0	158	114 10 0	0 11 7

(*B*) *Incubation Records.*

Incubation No.	Date Set.	Date Hatched.	N. Eggs set for hatching.	Infertile Eggs.	Dead Germs.	Dead in Shell.	Number of chicks hatched.	Hatch.*	Mature. M. F. Die
1	13th July 1938.	3rd August 1938.	43	10	5	11	17	60	4 9 4
2	11th August 1938	1st September 1938.	23	2	2	4	15	78	10 2 3
1	11th September 1938.	1st October 1938.	27	3	2	6	16	72	4 5 7
2	21st September 1938.	11th October 1938.	32	15	4	8	5	38	1 3 1
1	16th October 1938.	5th November 1938.	13	2	3	1	7	87	1 4 2
1	24th November 1938.	14th December 1938.	23	8	...	9	9	60	2 5 2
2	8th December 1938.	28th December 1938.	26	3	5	9	9	50	0 1 8
1	18th December 1938.	8th January 1939.	21	1	1	0	19	100	7 4 8
2	4th January 1939.	24th January 1939.	43	5	10	12	16	57	2 4 10
1	13th January 1939.	2nd February 1939.	43	4	1	12	26	68	5 10 9
1	12th February 1939.	4th March 1939.	27	1	1	6	19	76	8† 0 11‡

*Hatch is reckoned on the number of eggs left after infertile eggs and dead germs have been eliminated.

†8 Chicks are remaining from this hatch, but they are still too young to determine the sex.

‡This last hatch was of Light Sussex eggs entirely. The Chicks were weak, and did not stand the hot weather, hence high mortality.

IV. *Housing and Yards*—

(*a*) Experimental trials—*Nil.*

(*b*) Modifications—No remarks.

V. *Diseases and Pests.*—(*a*) Aside from normal mortality, and one or two cases of dropsy, no diseases have been noted in adult fowls. Among chicks, especially the later hatched ones, indigestion was prevalent. Leg weakness is also prevalent.

(*b*) Pests are not noticeable since regular spraying with kerosine oil, twice monthly, has been employed. Ticks have been practically eliminated by this means. A small house with thatched roof was erected and attempts made to eliminate accumulated ticks with the spray. But this was impossible; and after a few weeks, the house was taken down, as it afforded a secure resting place for ticks.

Sheep Breeding Farm, Poona.

Mr. S. S. Khot held charge of the Farm as the Manager during the year under report.

The object of the Farm as defined in the scheme is divided into the subjects as follows :—

(*i*) Improvement of the Deccani Sheep by selection.

(*ii*) Adaptability of the Merino to the Deccan.

(*iii*) Crossing of Deccani Sheep by the Merino with a view of finding out the possibility of a better animal.

(*iv*) Miscellaneous problems of Sheep Husbandry including ailments and diseases of sheep.

This and the subsequent reports will be dealt with under the above heads with the object of keeping continuity of policy.

Selection of Deccani Sheep.—In the classification of Asian sheep, the Deccani sheep is laid down as a breed by itself, but due to the neglect in selective breeding by the shepherd, this animal is still in the pre-historic stage. It is ill-shaped and badly woolled. The colour is generally black with all the variation of red and blue roan mixtures. Uniformity in quality of wool with even colour had to be made the basis of selection. The black colour of the sheep is not permanent. It degenerates into greys and roans as the sheep age. An all white animal with pink muzzle and carroty hoof has poor stamina. A white fleeced animal with mottled or black face coupled with dark hoofs was made the basis of selection. The difficulties in procuring such animals are detailed in the report.

The quantity and quality of wool yield along with the stamina of the animal are reorded for individual selection. Although the vitality and stamina cannot be gauged by figures the records of weights, measurements, health notes, along with photographical inprints against a graduated back-ground are being maintained to show the changes from generation to generation.

Quantity of wool yield is an easily determinable factor, but quality is a complex study. The fleeces of the farm animal are classed into three grades by feel and the length of the staple. Out of the forty animals which were present throughout the whole year on the farm, thirteen carry first grade wool, nineteen fall in the second quality and the rest have rough hairy wool.

Average wool yield per animal in two shearing of the year.—

	Average		Variation				
	lb.	oz.	lb.	oz.		lb.	oz.
First grade	1	1	0	14	to	1	13
Second grade	1	10	0	8	to	1	14
Third grade	0	13	0	11	to	1	3

The hand classification of wool is extremely useful for commercial purposes, but will be of little use in individual selection in scientific breeding of sheep and will particularly serve less in cross-breeding work. The best way is to resort to simple wool analysis methods. The importance of judging fleece by measurement of fineness, length of fibre and medullation percentage is evident from the little work done in this year.

Adaptability of the Merino to Deccan environment.—The Merino was imported in two batches of fifteen and twenty-five this year. The difficulties and precautions in management of this animal are given in the following points detailed in the conclusion of this part of the report.

(1) Do not move the Merino long distances in the heat of the summer. It affects their breathing, checks rumination and thus brings ill-health. Beware of dogs.

(2) Do not keep them on dry pasture alone during the hot season. If green is not available make provision of silage so that the sudden change to green in the monsoon does not have deleterious effects.

(3) Do not feed green lucerne in the afternoon. It is best given as the last feed at night.

(4) Do not feed grain alone. It is best given with a mixture of roughages.

(5) Unlike the Deccani sheep the Merino grazes day and night when conditions are favourable. The pastures in this country are very poor in nutrition, and the abundant green of this type does not meet the requirements of wool growth of Merino. It is, therefore, advisable to restrict grazing and stall-feed.

(6) In the monsoon, do not let out the Merino without a dry feed in the morning.

(7) Never allow lambs to graze till they are two months old. They must be brought up on dry food as the local shepherd does with his lambs.

(8) Except in the hot season dose every month against worms.

(9) Do not keep ewes with lambs with the rest of the flock. These ewes require special feeding and less disturbance than the dry flock.

(10) Do not leave the Merino ram with the flock too long for breeding. It is too excitable and goes off food. The method of leaving the rams with the ewes at night seems to be the best. At present the ewes in heat are singly shown to the ram.

(11) Shearing must be so arranged as to have sufficient wool on the backs of the sheep in the summer.

(12) Do not rely on the intuitive knowledge of the shepherd. He is a second cousin to nature and would, like her, allow the sheep the full benefit of the "struggle for existence."

Crossing of Deccani sheep by the Merino.—It took the better part of the breeding season this year, in getting the Merino rams to get used to the Deccan sheep in rendering services. Except in the improvement of wool quality the cross-bred lambs are showing very little uniformity in colour and structure of the body. The latter resembles indigenous sheep more than the Merino. The analysis of their characteristics are interesting although it will not prove any genetical concept at this stage.

Miscellaneous Problems—Time of Lambing—What crops are to the agriculturist, lambs are to the shepherd. The first duty of the farm is to find out what is the best time for lambing and how to achieve this. The first part of the problem is solved. The second part will be tackled.

The following are the three œstrus periods in the Deccan sheep with corresponding lambing seasons :—

Oestrus periods	Lambing season
(*i*) March–April	..Post-monsoon lambing.
(*ii*) June–July	..Winter lambing.
(*iii*) October–November	..Summer lambing.

It was found that the post-monsoon lambing is a fortune, winter lambing a worthy harvest and the summer lambing a calamity.

Dipping.—The farm water is extremely hard. Its use for dipping and washing sheep was found to have deleterious effect on the wool. The sheep had to be washed first in river water before dipping. The observations in the damage done to wool has shown that it is necessary to have the right type of water if the fleece bearing characters of indigenous sheep are improved. In arid tracts where sheep husbandry is generally concentrated the well waters are hard. In regions where river waters are not available, canal water can be made available.

Shearing.—The farm sheep are shorn with machine shears. Men are taught to handle a sheep without the help of a second person. The Deccan sheep cannot be shorn unless they are thoroughly washed. The cause of this cannot be laid down at this stage. It is hoped that this problem will be tackled when the laboratory for wool analysis will be sanctioned by the Provincial Government.

Docking.—The docking was done with hot chisel leaving a docked tail of about two inches, just to cover the vent. The wound quickly heals if the operation is done when the lamb is 14 days old. With the exception of one application of stockholm tar in the beginning no further treatment was found to be necessary. In the hot season a little powder of talc on the tar keeps the wound dry.

Worms.—Worms get the upper hand when the balance of health is on the ebb. The use of wormicides when the animal has lost its vitality is detrimental to its life. The symbiosis between the host and the worm is a factor which decides the fate of the former adversely and if the index of assimilation of nutrients does not rise the animal dies of anæmia. Three wormicides were tried—(1) Copper-sulphate, (2) Tetrachlorethylene, (3) Lugol's solution of Iodine. The first has very little effect on affected sheep. The second destroys worms but it has deleterious effect on an out of condition sheep. Lugol's solution of Iodine is still under trial.

Sheep-Maggot fly.—The weakened and worm attacked Merinos and a few Deccani sheep were a continuous trouble in autumn. After trying the methods of removing maggots by the use of terpentine, phenyle, etc., it was found that the remedy suggested by the South African Veterinary authorities was very highly effective. It consists of the following agents :—

Carbon tetrachloride	10½ Fl. oz.
Olium picis	8 Fl. oz.
Carbolic acid	3 Fl. oz.
Ammonia (10 per cent. sol.)	2 Fl. oz.
Gum (Acacia or Arabic)	2 Oz.
Water	75 Fl. oz.

Scouring of wool.—Any improvement in sheep will have to be tested by introduction of such animals in villages and for some years it will not be possible to offer sufficient quantities of improved wool to mills. The Deccani, the Merino or the cross-bred wool will have to be utilised in the cottage-industry for manufacture of home-spun cloth. The latter two wools are bound to be highly conditioned than the existing Deccan wool which requires very little effort to remove its extraneous matter and unless the fleeces of the former type are properly washed it will not be possible to spin them. Boiling, filtering and addition of soaps in right proportions would not only be a difficult process but will not be followed by village spinner. Fortunately after trials of different substances this difficulty has been solved by the use of soapnuts (Spindus trifoliatus) and at least for the cottage industry this discovery is going to be of immense use.

Grazing.—A list of grasses and bushes on which sheep graze is made. The nutritional aspect of the same along with the availability at different times of the year will be undertaken in the coming year.

The Provincial Fodder and Grazing Committee.

In pursuance of the recommendation of the All-India Conference at its meeting held at Simla in May 1937, a Provincial Fodder and Grazing Committee was constituted in the Bombay Province, consisting of 12 official and 6 non-official members, the Honourable Minister for Revenue, Rural Development and Agriculture, being as its Chairman and the Livestock Expert and the Working Plans Officer as Joint Secretaries of the Committee.

The Committee is purely an advisory body aiming at improving the grazing lands and thereby improve the cattle in the country generally.

The Committee held two meetings since its establishment to consider several proposals that came before the Committee, of which the Committee dealt with the following :—

1. Formation of District Committees.
2. Cattle survey in relation to the advantage taken and benefits derived from grazing.
3. Carrying out a survey and classification of all lands in the Province for management as pastures.
4. Improvement of grazing all over the Province by means of improvement to existing tanks.
5. Establishment of Central Research Station for improvement of grasses and pasture legumes.
6. Better utilization of present fodder resources.
7. Colonisation of professional breeders.
8. Reclamation of marl lands.
9. Reclamation of permanent water courses.
10. The New Forest Grazing Rules.

Formation of District Committees.—Since it was considered that the Committee by itself could not cope with this problem in all the Districts of the Province, the Committee recommended to Government to set up a District Fodder and Grazing Committee in each District of the Province.

Cattle survey in relation to the advantage taken and benefits derived from grazing.—The idea of this survey is to ascertain what use the villages make of grass lands and grazing lands that they have prior claim to, and make better use of the grass lands wasted by useless cattle that are of no value whatsoever. The Committee approved of the idea and recommended to Government the survey of 2 villages taken at random in certain Districts of the Province where good grazing is available, to be conducted by the Revenue and the Agricultural Departments, as it was not possible nor was it needed to take a complete survey of the whole Province.

Carrying out a survey and classification of all lands in the Province for management as pastures.—This proposal was not accepted fully by the Committee, as it was a large problem concerning the whole of the Province, which could not be tackled without complete survey of the lands. However, it emerged from it to start small grass land management experiments under the guidance of Deputy Directors of Agriculture. Further to this was also included the mixed farming scheme, and the whole combined scheme is to be put up before the Government of Bombay, for their consideration. The Committee has decided to give this work to the District Fodder and Grazing Committees on their formation.

Improvement of grazing all over the Province by means of improvement to existing tanks.—This was a proposal placed by the Forest Engineer. As the scheme was not a complete one, the Committee desired to have a more comprehensive scheme with full details as to the cost, number of cattle to be benefited, the grazing area covered, etc., etc.

Establishment of Central Research Station for improvement of grasses and pasture legumes.—The scheme as put up by the Economic Botanist to Government was approved of by the Committee, with the exception of the omission of "Hybridization" and "the study of effect of the addition of fertilizers to different species and selected strains" and was recommended to Government for being undertaken as early as possible.

The other four schemes, item Nos. 6, 7, 8, and 9 were referred back for more comprehensive proposals, and two of them, the Colonisation of professional breeders and the Reclamation of marl lands are in progress. Having had the information as required, these two proposals have been sent to Government.

The New Forest Grazing Rules.—The draft of revised rules for the regulation of grazing in the forest districts of the Province was considered by the Committee and accepted with recommendation that every care should be exercised to prevent hardship to the people.

Apart from the above-mentioned proposals and schemes, the Committee also discussed on various other questions such as references from the Imperial Council of Agricultural Research regarding Sir John Russell's recommendations and Dr. Wright's Report, Development of Cattle and Dairy Industries of India, etc., but as these were particularly being dealt with by the Director of Agriculture, they were left with him. The Committee also had few applications for grant of grazing lands, but as the Committee could only lay down the general principles that should guide Government, individual applications were considered to be disposed of by Government.

Programme of work under the Livestock Expert to Government, Bombay Province, Poona, for the year 1940-41.

I. *Breeding Farms.*—The policy of breeding reliable pure strains of cattle will continue, keeping in mind the production of a more economical animal, which will mature early and calve more regularly. The breeding of a good dual and draught purpose animal on the above lines will continue at Chharodi and Bankapur farm respectively.

II. Nutritional investigations and experiments will be conducted on various food-stuffs as far as finances will permit.

III (*a*). Propaganda in connection with the spreading of the use and benefits of Pedigree bulls will continue together with teaching of better methods of care.

(*b*) The herd Register of all pure cattle of each breed will continue. Thus in a few years we shall have all the pure types of cattle pedigree as we shall know the dams and sires. This also would help us in tracing the progeny of premium bulls. This method will be of great advantage to breeders as they can with the certificate supplied with each bull prove their animals to be well bred. (*c*) *Milk Recording.*

IV. The Co-operation with the Kandivli Gowrakshak Mandali will continue in breeding, raising and spreading the Gir breed in towns, together with the fine illustration of what can be done if the people are so inclined with Panjrapoles to make them useful institutions to the country instead of the burden they are at present.

V. *Poultry.*—(*a*) The work of breeding suitable foreign breeds of poultry will continue on the Government Central Poultry Farm, Kirkee.

(*b*) Investigations regarding incubation, control of diseases and feeding of poultry will continue.

(*c*) To help and advise poultry breeders as far as it is possible.

(*d*) Experiments in the egg laying capacity of different breeds in single testing pens will continue.

(*e*) Egg Grading.

VI. *Sheep Improvement Work.*—The Sheep Breeding Farm, Poona, financed by the Imperial Council of Agricultural Research, will be continued the breeding of Merino and Deccan Sheep and their crosses.

VII. The Scheme for Research in Poultry Husbandry financed by the Imperial Council of Agricultural Research will be continued during the year.

VIII. *Palghar Dairy District Scheme.*—There seems to be little chance for the scheme to succeed as Government have withheld the giving out of land.

IX. *Village Improvement Scheme.*—The following sections under the above scheme will be continued :—

(*i*) Village Poultry Improvement on intensive scale.

(*ii*) Poultry Stations Scheme.

X. Provincial Fodder and Grazing Committee Work.

APPENDIX I.

Statement showing age at first calving of the Heifers that

Serial No.	Daughters. Name.	Brand number.	Date of Birth.	Sire.	Age at first calving. Yrs.	Mths.
1	Ravti ..	22	23rd November 1934.	Nasal 3-29 ..	3	4½
2	Vanar ..	16	21st May 1934 ..	Do. ..	3	11½
3	Ujol ..	27	28th December 1934.	Do. ..	4	1/4
4	Nasal ..	4	29th January 1935.	Do. ..	3	11½
					14	4¾
				Average ..	3	7
5	Nasal ..	21	3rd August 1935 .	Meghan 15-29 ..	3	7½
6	Lilor ..	11	19th March 1934..	Do. ..	4	6¾
7	Chakli ..	3	27th January 1935.	Do. ..	4	2
8	Bodli ..	19	23rd June 1935 ..	Do. ..	3	9½
					16	1¼
				Average ..	4	¼
9	Bhotu ..	8	23rd February 1934.	Ravti 30-29 ..	4	4½
10	Nasal ..	21.	6th October 1934.	Do. ..	3	9½
11	Santu ..	13	21st April 1934 ..	Do. ..	4	3
12	Patoli ..	2	18th January 1934.	Do. ..	4	6½
13	Medhi ..	15	7th May 1934 ..	Do. ..	4	3¾
14	Patoli ..	7	1st March 1935 ..	Do. ..	3	9¾
15	Boked ..	23	29th November 1934.	Do. ..	4	3½
16	Selar ..	6	14th February 1935	Do. ..	4	1
17	Santu ..	17	20th April 1935 ..	Do. ..	3	11
18	Bhotu ..	10	14th March 1935..	Do. ..	4	½
19	Mojdi ..	11	15th March 1935..	Do. ..	4	½
					45	5½
				Average ..	4	1½

DIX I.

calved during 1938–39 as compared with their Dams.

Dams.

Name of Dam.	Brand number.	Date of Birth.	Sire.	Age at first calving.	
				Yrs.	Mths.
Ravti.. ..	20	21st April 1921 ..	Vadli ..	4	8½
Vanar ..	1	1st January 1925 ..	Senduri ..	4	5¼
Ujol	4	23rd February 1929 .	Farsi	3	10¼
Nasal ..	35	18th November 1934.	Senduri ..	4	4½
				17	4½
			Average ..	4	4¼
Nasal ..	30	16th May 1926 ..	Mohan ..	4	¼
Lilor	6	26th January 1926 ..	Kanudo ..	4	5½
Chakli ..	17	25th March 1926 ..	Mohan ..	4	11½
Bodli ..	33	27th May 1926 ..	Mohan ..	3	10¼
				17	3½
			Average ..	4	3¾
Bhotu ..	1	19th February 1928 .	Todar ..	4	3
Nasal ..	19	24th September 1929	Renchhi 23-25 ...	3	11¾
Santu ..	6	14th March 1929 ..	Todar ..	3	10
Patoli ..	2	28th January 1929 ..	Todar ..	3	11
Medhi ..	12	10th April 1925 ..	Bhim ..	4	¾
Patoli ..	13	8th June 1931 ..	Kachari 8-25 ..	3	6¾
Boked ..	31	13th December 1927.	Todar ..	5	0
Selar	12	16th December 1930 .	Renchhi ..	4	2
Santu ..	6	14th March 1929 ..	Todar ..	3	10
Bhotu ..	37	4th February 1925 .	Bhim ..	5	½
Mojdi.. ..	28	17th December 1928 .	Todar ..	5	2½
				46	11
			Average ..	4	3¼

Serial No.	Daughters.					
	Name.	Brand number.	Date of Birth.	Sire.	Age at first calving.	
					Yrs.	Mths.
20	Rozi ..	28	29th December 1934.	Vanar 2–27 ..	4	½
				Average ..	3	9
21	Chakli ..	4	23rd January 1934.	Ujol 11–31 ..	4	3
22	Temore ..	5	25th January 1934.	Do. ..	4	4
23	Ujol ..	20	2nd September 1934.	Do. ..	3	10½
24	Do. ..	14	21st April 1934 ..	Do. ..	4	3¾
				Average ..	16	9¼
					4	2¼
25	Ruli ..	2	26th November 1933.	Ravishankar ..	5	2½
26	Airavi ..	1	5th January 1935.	Do. ..	4	1½
				Average ..	9	4
					4	8
27	Rupli ..	12	1st August 1934..	Alo ..	4	6½

DIX I—*contd.*

Dams.

Name of Dam.	Brand number.	Date of Birth.	Sire.	Age at first calving.	
				Yrs.	Months.
Rozi	9	30th April 1931 ..	Pasvo ..	3	8
			Average ..	3	9½
Chakli ..	17	25th March 1926 ..	Mohan ..	4	11½
Temore ..	21	4th June 1922 ..	Mohan ..	3	10
Ujol	6	2nd April 1931 ..	Pasvo ..	3	5
Do.	4	18th January 1926 ..	Mohan ..	5	2½
			Average ..	17	5
				4	4½
Rukhi ..	78/27	29th March 1919 ..	Patal ..	4	¼
Aileen ..	90/14	29th March 1919 ..	Mohan ..	4	1½
			Average ..	8	1¾
				4	¾
Rupali ..	192/78	10th December 1925 .	Kevdo ..	4	3

APPENDIX II.

Statement showing Effect of Sires on "Early Maturity" in their Daughters as compared with their Dams from 1917 to 1939.

Serial number.	Name of Sire.	Number of Daughter.	Average age at which Daughters calved first.	Average age at which Dams calved first.	Improvement in Maturity over Dam.
1	2	3	4	5	6
			Yrs. Mths.	Yrs. Mths.	Yrs. Mths.
1	Mohan	53	4 1¼	5 5	1 3¾
2	Kachari of 1911 ..	12	4 6½	5 8	1 1½
3	Nawab	8	5 4	5 6½	0 2½
4	Sultan	8	4 11¼	5 4¼	0 5
5	Chitram	26	4 5¼	5 9¼	1 4
6	Moti	3	4 10¾	4 11½	0 ¾
7	Vadli	3	4 10	4 11½	0 1½
8	Kanudo	9	4 1½	5 8¼	1 6¾
9	Senduri	6	3 11½	5 5	1 5½
10	Bhim	27	3 11¾	5 3	1 3¼
11	Resham	3	3 11½	5 1	1 1½
12	Faterio	6	4 3¾	5 8½	1 4¾
13	Kevdo	2	4 3	4 10	0 7
14	Bhuri	2	4 11	5 ¾	0 1¾
15	Bhotu 2–1924 ..	1	4 2	4 1¾	0 ¼
16	Todar	18	4 3½	4 10½	0 6¾
17	Farsi	3	4 2¼	4 ¼	0 2
18	Kachari 8–1925 ..	9	3 11½	4 4½	0 4¾
19	Renchhi	10	3 10	4 7¼	0 9¼
20	Bhotu 41–25 ..	7	3 9¼	4 6¼	0 9
21	Pasvo	4	3 5½	4 8¼	1 2¾
22	Kesar 6–28	6	4 0	4 1¼	0 1¼
23	Chandlee 20–28 ..	12	4 ¾	4 5½	0 4¾

APPENDIX II—*contd.*

Serial number.	Name of Sire.	Number of Daughters.	Average age at which Daughters calved first.	Average age at which Dams calved first.	Improvement in Maturity over Dam.
1	2	3	4	5	6
			Yrs. Mths.	Yrs. Mths.	Yrs. Mths.
24	Waghen 12–28 ..	4	4 2½	4 1½	0 1½
25	Padol 8–29	6	3 10	4 4	0 6
26	Meghan 15–29 ..	6	3 9	4 0	0 3
27	Ujol 11–31	6	3 11½	4 3½	0 3½
28	Nasal 3–29 ..	6	3 7½	4 4½	0 9½
29	Ravti 30–29 ..	15	4 0	4 3½	0 3½
30	Nasal 22–30 ..	1	3 8½	3 6	0 2½
31	Vanar 2–27	2	3 9	3 9½	0 ½

APPENDIX III.

Statement showing regularity in calving in Originals F-1, F-2, F-3 and F-4 Generations during the year 1938–39.

Generations.	Number of cases.	Age at first calving.	Interval between calvings.			
			I and II.	II and III.	II and IV.	IV and V.
		Y. M.	Y. M.	Y. M.	Y. M.	Y. M.
Originals ..	103	5 7½	1 10½	1 8½	1 7½	1 5½
F-1 ..	163	4 4½	1 6½	1 4	1 2½	1 2½
F-2 ..	97	4 0	1 5	1 3½	1 2½	1 2
F-3 ..	18	3 10½	1 4½	1 3½	1 ½	1 1½
F-4 ..	3	3 10½	..	..	..	..

APPENDIX IV.

Statement showing acreage and yields of different fodder crops together with the cost of production per acre at the Bankapur Cattle Breeding Farm for the year 1938-39.

Serial number.	Name of Fodder crop.	Total area cropped.	Total yield of crops in pounds			Average calculated yield of green fodder per acre.	Cost of cultivation per acre.	Remarks.
			Green Fodder.	Dry Fodder.	Seeds.			
		A. g.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	
1	Jowar ..	6 20	118,248	8,800	2,950	23,074	69 5 0	Kharip crop
2	Maize and Chavli ..	13 20	234,929	39,750	7,150	26,145	90 0 0	Do.
3	Ragi ..	3 10	46,566	..	..	14,328	46 8 0	Do.
4	Soyabeans and Chavli ..	5 30	62,897	..	..	10,938	40 4 0	Do.
5	Kulthi ..	4 0	6,744	..	..	1,661	13 3 0	Rabi crop
6	Matki and Wal	12 10	3,040	10,083	200	2,371	12 14 0	Do.
7	Lucerne ..	0 5	2,285	..	..	18,280	190 7 0	Irrigated
8	Elephanta grass and Guinea Grass	0 35	31,550	..	..	36,057	100 3 0	Do.
	Total ..	46 10						

APPENDIX V.

Statement showing the single testing pen record on the Government Central Poultry Farm, Kirkee, for the year 1938–39.

Pen No.	Hen No.	Breed.	Number of egg laid in eight months.	Total weight of eggs in ozs.	Average number of eggs per year on the bases of 8 months record.	Average weight of an egg in ozs.
		White Leghorn.				
1	1	Do.	122	253$\frac{3}{16}$	183	2·08
2	3	Do.	128	285	192	2·22
3	5	Do.	105	198$\frac{5}{16}$	157·5	1·88
4	7	Do.	145	282$\frac{1}{16}$	217·5	1·93
5	9	Do.	137	269$\frac{1}{16}$	205·5	1·97
6	11	Do.	25	50$\frac{7}{8}$	37·5	2·04
7	13	Do.		Died on 24th July 1939.		
8	15	Do.	118	228	177	1·93
9	17	Do.	104	192	156	1·5
10	19	Do.	147	306$\frac{9}{16}$	220·5	2·08
11	21	Do.		Died on 31st March 1939. Renewed in February.		
12	23	Do.	162	305$\frac{5}{8}$	243	1·85
13	25	Do.	161	310$\frac{3}{16}$	241·5	1·93
14	27	Do.		Died on 12th February 1939.		
15	29	Do.	147	273$\frac{1}{4}$	220·5	1·85
16	31	Do.	160	297$\frac{9}{16}$	240	1·86
17	33	Do.	108	202$\frac{1}{2}$	162	1·87
18	35	Do.	158	319$\frac{3}{8}$	237	2·01
		Total of White Leghorn	1927	3,775$\frac{7}{16}$	2,890·5	5,656
		Average ..	128·46	1·95	192·69	1·95

APPENDIX V—*contd.*

Pen No.	Hen No.	Breed.	Number of eggs laid in 8 months.	Total weight of eggs in ozs.	Average number of eggs per year on the bases of 8 months record.	Average weight of an egg in ozs.
		Rhode Island Red.				
1	2	Do.	81	174 1/16	121·5	2·14
3	6	Do.	116	237 1/8	174	2·05
5	10	Do.		Died on 8th April 1939.		
7	14	Do.	66	125 1/2	99	1·9
9	18	Do.	117	232 3/16	175·5	1·99
11	22	Do.	111	195 11/16	166·5	1·76
13	26	Do.		Died on 25th February 1939.		
15	30	Do.	129	232	193·5	1·79
17	34	Do.	153	296 11/16	229·5	1·94
		Total of R. I. ..	773	1,494 3/8	1,159·5	22·44
		Red Average ..	110·42	1·93	*165·63*	*1·93*
2	4	Australorp ..	99	199 7/16	148·5	2·0
4	8	Do.	36	79 1/2	54	2·22
6	12	Do.	122	247 7/16	183	2·02
8	16	Do.	137	264 11/16	205·5	1·93
10	20	Do.	150	302 1/16	225	2·01
12	24	Do.	38	82 7/16	57	2·15
14	28	Do.	105	258 5/16	157·5	2·46
16	32	Do.	119	239 1/2	178·5	2·01
18	36			Died on 10th March 1939.		
		Total of Australorp ..	806 100·75	1,674 1/8	1,209	2
		Average ..	..	2·07	151·12	2·07

APPENDIX VI.

Statement showing the result of hatching percentage of chicks on the

Serial number.	Breed.	Number of eggs put in the incubator for hatching.	Number of eggs found infertile.	Number of eggs found broken yolks.	Number of eggs found addled.	Percentage of infertile eggs.	Percentage of broken yolk eggs.	Percentage of addled eggs.	Total number of eggs rejected.	Percentage of rejected eggs.
1	White Leghorn	782	139	67	27	17·74	8·56	3·45	233	29·79
2	White Wyandotte ..	437	284	34	7	64·98	7·78	1·61	325	74·36
3	Rhode Island Red ..	588	153	34	22	26·02	5·78	3·74	209	35·54
4	Australorp ..	583	293	26	21	50·25	4·46	3·65	340	58·31
5	Black Minorca ..	510	109	37	20	21·37	7·25	3·92	166	34·51
6	Well Summer ..	76	1	3	1	1·31	3·94	1·31	5	6·58
	Total ..	2,976	979	201	98	32·56	6·72	3·29	1,278	42·73

DIX VI.

Government Central Poultry Farm, Kirkee, during the year 1938-39.

Balance.	Half developed and dead in the shell.	Fully developed and dead in the shell.	Percentage of half developed and dead in the shell.	Percentage of fully developed and dead in the shell.	Number of chicks hatched.	Percentage of chicks hatched.	Chicks died and destroyed after hatching.	Percentage of chicks died and destroyed after hatching.	Healthy chicks taken into account.	Percentage of healthy chicks taken into account.
549	24	101	4·55	18·39	424	75·4	55	12·97	369	67·03
112	6	34	5·35	30·35	72	64·28	6	8·33	66	58·92
379	6	73	1·58	19·23	300	79·15	30	10·0	270	71·24
243	13	54	5·34	22·22	176	72·42	34	19·31	142	57·61
344	18	73	5·23	21·22	253	73·54	47	18·57	206	59·88
71	4	28	5·63	39·43	39	54·92	2	5·12	37	52·11
1,698	71	363	4·24	21·37	*1,264*	*77·44*	174	13·76	1,090	64·19

APPENDIX VII.

Statement showing the cost of hatching chicks on the Government Central Poultry Farm, Kirkee, during the year 1938–39 from 1st July 1938 to 30th June 1939.

Number of setting eggs issued for hatching.	Cost of setting eggs at —Rs. 3-0-0 per dozen.	Quantity of kerosine oil 150° test, water-white brand used for hatching.	Cost of kerosine oil used for incubation.	Number of chicks (healthy) hatched.	Total cost of hatching chicks including the cost of setting eggs.	Average cost of chick hatched including the cost of setting eggs.	Average cost of kerosene oil used for hatching each chick.	Average cost of hatching each chick in an incubator.	Remarks.
1	2	3	4	5	6	7	8	9	10
	Rs.	Rs. a. p.	Lbs. Ozs.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Lbs. Ozs.	
2,976	744	573 8 0	72 7 0	1,000	816 7 0	0 11 11·81	0 15·77	0 1·07	

APPENDIX M.

Summary of Work done under the Agricultural Engineer to Government of Bombay, Poona for the year 1938-39.

Mr. C. G. Paranjpe was in charge of the Agricultural Engineering Section during the year under report. There has been a little change in the staff due to the appointment of Mr. R. P. Patel, B.E., Mechanical Assistant, Gujrat, as Factory Inspector under the Chief Inspector of Boilers, Bombay, and to the retirement of Mr. S. G. Dhengle, fitter. The section has lost in Mr. Patel, a very able assistant and in Mr. Dhengle, a very capable and resourceful fitter. There has been, however, a very good addition in Mr. Patel's place as the Mechanical Assistant's post has been now occupied by Mr. P. J. Patel, M.Sc., (Iowa, U.S.A.) on his return from America, after completing his course in Agricultural Engineering. Mr. Dhengle's place has been taken up by Mr. More, one of the senior drivers.

The section was exceptionally busy during the year under report on account of various important works, such as the construction of the Virus glass house, Insectary and Potting house for the Plant Pathologist to Government at the College of Agriculture, Poona, the demolition of barrack No. 14 and constructing from its materials 2 blocks at different places, the construction of a small Glass house for the Cotton Breeder at Surat Farm, the construction of quarters for 40 students at the Poultry Farm and for 100 students at the Fruit Experiment Station, Kirkee, together with dining and bath rooms, kitchens etc., the construction of a Bee house, stores and office for the Bee Expert at Kirkee, the erection of new machinery at the Dharwar Farm, purchase of pumping plants, fencing materials, tool sets for carpentry, fitting and smithy for the Vocational Schools at Godhra and Bijapur, erection of a bore-hole power pump at the Kumtha Farm, erection of a pumping plant on river Ulhas in Thana District in connection with the village improvement scheme, demonstration of improved implements and machines at the Industrial Show at Poona and the like. Out of the above works the Insect-proof Glass Houses have taken considerable amount of time, energy and thought as the nature of the work was unusual.

Advice, help and inspection.

The general activities of the section are steadily on the increase which would be known by the increased demand for advice and actual help. The number of inquiries have gone upto 253 against 219 of the previous year, out of which 83 are for pumping, 50 for boring, 11 for tractor ploughing, 6 for cane crushing, 22 for hire of plants, 54 for repairs to machinery and 27 for miscellaneous works. The sites surveyed amount to 34 and the estimates supplied for power plants amount to 60. The drawings and sketches made out amount to 82 while the erections of

new plants including modifications or re-erections of the old, amount to 27. As the number of erections and repairs was considerably increased, the Mechanical Assistants were not able to devote much attention to the inspection of private plants owned by cultivators. They could inspect 111 plants only during the year under report. The aggregate work done by the Mechanical Assistants in the divisions is given in the following statement.

Description of work.	Attended to by the Mechanical Assistant at—			Total.
	Dharwar.	Poona.	Surat.	
Private plants inspected ..	31	45	35	111
Plants repaired	8	8	17	33
Plants erected	8	10	5	23
Sites surveyed	15	5	5	25
Estimates supplied ..	9	20	6	35

The number of cultivator students trained in the oil engine class, attached to the workshops, amounts to 13, while those trained in the special sugarcane class, opened at Arbhavi Farm, in Belgaum District, amount to 22.

Research on Implements.

The work done on implements and other appliances is confined to the following :—

(1) Improved seed drill.

(2) Soil Scooper.

(3) Winnowing fans.

(4) Cart wheels fitted with ball bearings.

(5) Groundnut digger.

A brief summary on the progress done on each is given as below :—

Seed drill.—Further experiments in connection with the improved seed drills have been discontinued with the exception of the special wheat drill designed for Jalgaon tract, as decided in the meeting of the Agricultural Officers, held in the office of the Director of Agriculture, B. P., Poona.

In all 23 improved seed drills have been so far made and supplied to different departmental institutions and out-siders including the Superintendent, Powerkheda Government Farm in the Central Provinces, for whom a special wheat drill has been prepared and supplied. The drill has come to such a stage now that further radical improvements in its design appear to be impossible, especially when its cost and draft are to be kept within a certain limit. The recent improved models have practically fulfilled all the stipulated conditions, both as regards draft and quality of work. There are, however, a few draw-backs in the machine that it is more costly than a local drill and that it cannot be worked when the soil is wet or where there is slight drizzling of rain. Such defects cannot, however, be remedied, unless its cost and draft are increased to a certain extent and although its cost is much less than that of an automatic drill of foreign make, still it is considered to be beyond the capacity of an average farmer. Its advantages such as automatic and uniform sowing, reduced draft, adjustment in depth and seed rate, saving in seed etc. etc. have been, however, fully appreciated. The question of cost can be solved if they can be manufactured on a mass, production basis and that is only possible if such machines could be introduced on co-operative lines.

Soil Scooper.—As mentioned in the last year's report, the scooper, which was brought to Poona, from the Bijapur Dry Farm, for necessary modifications, was further improved with a view to make it suitable for the peculiar soil conditions at Bijapur and sent back for trials. During the short preliminary trials which were lately conducted, it was observed that the machine was found to work more satisfactorily than before with the improvements effected. More exhaustive trials are however necessary in order to say some thing definite as regards its efficiency or further modifications but they could not be taken up-til now on account of unsuitable soil conditions at Bijapur.

Winnowing Fans.—The winnowing fans have become very popular with the cultivators as the demand for same is gradually on the increase. During the year under report in all 15 new fans have been prepared and supplied to different parties, such as vocational schools, propaganda officers, private farmers and Taluka development associations etc. Opinion of several of these people was asked for and almost all of them have reported that these fans work satisfactorily. Some have suggested to make arrangements, if possible, of changing the direction of the fan easily and in a short time in case of necessity to suit the changing direction of the natural wind, as the wind in the opposite direction obstructs its

satisfactory working. Further experiments in view of these suggestions are therefore in progress.

Carts fitted with ball bearings.—In all 12 sets of cart wheels have been fitted with ball bearings and supplied to different parties during the year as detailed below :—

	Name of the party	Number of sets
1.	Professor of Agriculture, Agricultural College, Poona.	3
2.	Head Master, Dhulia School.	1
3.	District Agricultural Overseer, Nasik.	1
4.	Maharashtra Sugar Mills, Belapur Road.	1
5.	Mr. D. V. Khadilkar of Sangli.	1
6.	Manager, Sheep Breeding Farm, Poona.	1
7.	Manager, Agricultural College Dairy, Poona.	1
8.	Superintendent, Effluent Farm, Hadapsar.	1
9.	The Imperial Agriculturist, New Delhi.	1
10.	The Agricultural Engineer, Poona, (for museum).	1

Out of the 3 sets supplied to the Professor of Agriculture, College of Agriculture, Poona, one set of wheels having small bosses almost similar to those used in Khandesh, has been fitted with ball bearings with a different contrivance to suit the smaller size of the boss. If this arrangement of fixing the ball bearings is found to be satisfactory, the problem of fixing such bearings in Khandesh wheels will be solved.

A special boring tackle appears to be a necessity for boring these wheels to fix the ball bearings, as the ordinary lathe cannot admit them on account of their large diameter.

Opinions received from all the parties whom such wheels have been supplied clearly show that the introduction of ball bearings in the ordinary cart wheels has been much appreciated, on account of ease in working, saving in lubrication, reduction in draft etc., etc.

Groundnut Digger.—Out of the 3 diggers that are built for trials, one was sent to Gokak as per request of the President, Taluka Development Association, the second was sent to Karad and the third to Madha in Sholapur District for trials and demonstrations. The reports received from the President, Taluka Development Association, Gokak, and the District Agricultural Overseer, Karad, show that the diggers were demonstrated at various places and found to work very satisfactorily and the cultivators who were present at the time of their trials were very much pleased with their performance. The third digger which was sent to Madha, however, did not work well as the soils, it had to deal with were exceptionally stiff. A more stronger machine appears to be

necessary for this tract, as a stronger support to the blade alone, introduced as a result of past experience, did not suffice. Recent trials with the machine revealed that the whole frame of the digger needs stiffening if it has to work successfully in such hard and cracked soils. The digger had, therefore, to be brought back to Poona for further improvements.

Installation of machinery for private individuals Departmental Institutions and Public Bodies etc.

A brief summary of the work done by the section in connection with installation of power plants for private individuals, public bodies and departmental institutions is given as under according to different divisions.

Central Division.

1. Re-erection of a 12½ BHP Blackstone crude oil engine at Government Farm, Jalgaon.
2. Re-erection of 18 BHP Hindustan crude oil engine at Government Farm, Kopergaon.
3. Erection of 8 BHP Peter crude oil engine and a deep-well borehole pump with countershaft at Sheep Breeding Farm, Poona.
4. Erection of 28 BHP Ruston engine, a cane crusher, juice pump etc. for Rao Saheb Shembekar at Baramati.
5. Erection of 18 BHP Hindustan crude oil engine with Vasant cane crusher, 18″ grinding mill, shafting etc. for Rao Saheb S. T. Jachak at Sansar.
6. Erection of a pumping plant consisting of 8 BHP Ruston engine and 2½″ Centrifugal pump with countershaft etc. on a well at Gangapuri cattle farm of the Taluka Development Association, Jamner.
7. Erection of a pumping plant consisting of 8 BHP Ruston engine and 3″ centrifugal pump on a well of Mr. Vinayak Ramchandra Deshpande at Nandoshi, taluka Haveli.
8. Erection of a 10 BHP Ruston engine, 2½″ Centrifugal pump and 18″ grinding mill with necessary shafting on a well of the Christ Seva Sangh, Aund, Poona.
9. Erection of a 10 BHP Ruston engine and 2½″ pump on a well for Mr. Haribhau Annaji Patil, Butte of Junnar.

Central Division—contd.

10. Erection of a 10 BHP Ruston engine, 2½″ centrifugal pump and 18″ grinding mill with countershaft on a well of Mr. Gopal Jivaji Durape at Kasur, taluka Junnar.

11. Erection of a Gibb's module at Government Farm, Kopergaon.

12. Erection of a pumping plant consisting of an 8 BHP Blackstone crude oil engine and 3″ Gwynnes centrifugal pump on river Ulhas for the Village improvement scheme.

13. Erection of a 12 BHP Blackstone crude oil engine and 3″ Kirloskar pump with countershaft, grinding mill etc. for Mr. Chindha Parashram Patil of Meshi, taluka Malegaon, on a well.

14. Erection of a 4″ Kirloskar centrifugal pump on a well with piping, water channel etc. for Mr. Bapu Shankar Patil of Sakurdi, taluka Malegaon.

15. Erection of a Rahat at Varsai, taluka Pen, district Kolaba, on a river.

Southern Division.

16. Erection of an 8 BHP Kirloskar engine and 3″ ball bearing Kirloskar pump on a well at Navloor, district Dharwar.

17. Erection of an 8 BHP Kirloskar engine and 3″ S. L. type pump on the bank of river Malprabha at Manoli.

18. Erection of overhead tank and laying of pipe line at Government Farm, Dharwar.

19. Erection of a 6 BHP Lister engine and 2″ Tobata pump on the bank of a *Nala* at Balwantari (Kalghatgi).

20. Erection of Sugar centrifugal and shafting at Government Farm, Arbhavi.

21. Erection of a 7 BHP Hindustan crude oil engine, 2½″ centrifugal pump with piping, chaff-cutter and countershaft etc. at the Government Farm, Dharwar.

22. Erection of 10 BHP Petter engine and 3″ pump on the river at Arjunwad.

23. Erection of a Myers pump at Government Farm, Mugod.

Gujarat Division.

24. Erection of a 16 BHP Ruston crude oil engine and 3″ Ruston centrifugal pump.

25. Erection of 22 BHP Ruston crude oil engine and 3″ centrifugal pump.

26. Erection of a 5 BHP Petter crude oil engine and a 2″ Pulsometer A type pump.

27. Erection of a 4 NHP Steam engine for lime juice distillation.

28. Erection of a Karamat cane crusher.

Repairs to private and Government Plants.

The following is a short account of the repairs conducted by the Section in connection with some of the important plants in the Province.

1. Repairs to the engine of the portable chaff-cutter at Dharwar Farm.

2. Repairs to an engine at Yardal, district Belgaum.

3. Repairs to the Pumping Plant at Government Farm, Indi.

4. Repairs to the old pipe line at the Government Farm, Dharwar.

5. Repairs to the old Myers pump at the Government Farm, Mugad.

6. Repairs to 8 BHP Blackstone vertical engine and cotton gin at Bhadgaon Farm.

7. Repairs to 10 BHP Ruston engine and the chaff-cutter at Pimple Farm for the T.D.A., Jalgaon.

8. Repairs to 8 BHP Blackstone Vertical engine and pump at Yeranzad, taluka Kalyan.

9. Repairs to 18 BHP Hindustan engine and Hemant cane crusher at Kopergaon Farm.

10. Repairs to 9 BHP Ruston kerosine engine and pump at Vithalnagar.

11. Repairs to 7 BHP Hatti engine and pump at Manmad.

12. Repairs to 7 BHP Hatti engine and pump at Komba, taluka Kalyan.

13. Repairs to Myers pump at the Dry Farm, Bijapur.

14. Repairs to the bore-hole power and hand pumps at the Sheep Breeding Station, Poona.

15. Repairs to the bore-hole pump at Rice Breeding Station, Karjat.

Special Works.

The section was entrusted with the following special works in addition to its normal activities during the year under report. The construction of the insect-proof glass houses built at the Agricultural College, Poona, for the Plant Pathologist to Government, took a considerable time and energy as the nature of work was entirely different. The houses are made of steel throughout and are fitted with rubberlined doors, in order to make them insect-proof. A roof ventilator is provided for each house for its entire length on either side of the ridge and a special lifting device consisting of a combination of pulleys, levers and multiple screws, has been provided for each, to operate them according to needs. All the openings in windows, ventilators etc. are closed with phosphorous bronze wire gauze of 40 mesh to prevent the ingress of insects into the houses even when the windows or ventilators are opened.

(*a*) Insect-proof Glass House for 'Virus' work consisting of one big room, (28′ × 15′), 2 small rooms (14′ × 15′ each) a central passage and a porch complete with steel frame work, necessary windows, roof ventilators, tables, taps, drains etc., etc. with all openings fitted with a 40 mesh phosphorous bronze wire gauze.

	Length.	Breadth.	Height.
Dimensions	60′—1⅝″	15′—4⅝″	10′

(*b*) Insectary of the same description as the above 'Virus' house but of the following dimensions.

Length.	Breadth.	Height.
15′—4″	14′—0″	10′—0″

(*c*) Potting House 30′ long, 15′—10″ wide, and 10′ high with Manglore tiled roof, steel frame work, brick walls etc., etc. complete with working tables, gas and water connections

(*d*) Quarters for 100 cultivator students at the Fruit Experiment Station, Kirkee, consisting of 9 rooms, each 20′ × 20′ including a 5′—0″ verandah in the front, having Mangalore tiled roof, brick walls, wooden frame work and reinforced concrete plinth etc., etc. complete with dining room, bath rooms, kitchen, latrines, water taps etc., etc.

(*e*) Quarters for 40 cultivator students at the Poultry Farm consisting of 4 rooms of the above description complete with water taps, kitchen, dining room, bath room, latrines etc.

(*f*) Glass house at Surat Farm for the Cotton Breeder 10′ long, 9′ wide and 6½′ high to the eaves complete with steel frame work, wire gauze pannels on the sides, working tables etc., etc.

The first three houses are built from the funds provided by the Imperial Council of Agricultural Research, Delhi. All the four glass houses described above have been built departmentally with the resources available at the shops.

Works done at the Shops.

The following is a brief summary of the work done at the shops for the Section itself, other departmental institutions and private individuals.

1. Repairs to the wheel barrow of Fruit Experiment Station, Kirkee.
2. Repairs to the condenser of the Cold Storage Plant, Kirkee.
3. Repairs to engine and cane crusher at Arbhavi Farm.
4. Repairs to the Chaff-cutter of Mr. V. V. Gadgil.
5. Repairs to the Plough of Mr. W. D. Moodliar of Poona.
6. Modifications in Sharple's separator of the Professor of Agricultural Engineering and Mathematics, Agricultural College, Poona.
7. Designing and building a stand for the drawings of implements etc. for the Professor of Agricultural Engineering and Mathematics.
8. Making a new pair of big end brass etc. for the engine at Kopergaon Farm.
9. Repairs to sprayers of Phaltan State.
10. Repairs to Dumpy level stands of the Bunding Officer, Poona, and the Professor of Agricultural Engineering and Mathematics, Agricultural College, Poona.
11. Making an angle iron clamp for the District Agricultural Overseer, Karjat, for the repairs to Rahat.
12. Repairs to the bucket pump of the Economic Botanist to Government, Bombay, Poona.

13. Repairs to sprayers of the T. D. A., Haveli.

14. Repairs to the Sugarcane mill and overhauling of the Bullock power chaff-cutter of the Agricultural College, Poona.

15. Making iron posts for the Principal, College of Agriculture, Poona and the Crop Botanist to Government, Karjat.

16. Repairs to the Autoclave of the Horticulturist to Government, Poona.

17. Complete overhauling of the Hay Press of the Sheep Breeding Station, Poona.

18. Repairs to the garden shears of Modibag, Poona.

19. Repairs to the Chaff-cutter of the Sheep Breeding Station, Poona.

20. Repairs to the engine parts of the Agricultural College Dairy, Kirkee.

21. Repairs to Baling machine parts of the Chharodi Farm.

22. Repairs to 5 Calyx machines.

23. Repairs to petrol engine pump of the Karajgi Baling Plant.

24. General repairs to Workshops and Experimental Well machinery.

25. Repairing and fixing of 9" tube well turbine pump on the Experimental Well.

26. Experiments of levelling instruments of the Professor of Agricultural Engineering and Mathematics.

27. Work in connection with a contrivance for pocketing bee-hives, for the Bee Expert.

28. Experiments and testing of Jet-flame guns of the Professor of Entamology, Poona.

29. Repairs to Case Tractor loaned to N. C. D. for anti-erosion scheme.

30. Work in connection with fencing round the glass houses and Land Development Court, Agricultural College, Poona, and for the Bee Expert, Fruit Experiment Station, Kirkee.

31. Making and fixing curtains in glass houses for the Plant Pathologist to Government, Poona.

Machinery hired out.

The following is a list of machines supplied to different people at the prescribed rate of hire.

Boring Machines.

1. Two F-3 Calyx drills to Messrs. Manhar Brothers, Junagad.
2. One F-3 Calyx drill in to Haveri Municipality.
3. One F-3 Calyx drill to Mr. G. C. Govande of Poona.
4. One F-3 Calyx drill to the Sholapur Spinning and Weaving Co., Sholapur.
5. One F-3 Calyx drill to Mr. Ballarinath of Haveri.
6. One F-3 Calyx drill to the Executive Engineer, Nira Canals Division.
7. One Musto Power Boring Machine to Mr. G. C. Govande of Poona.
8. One F-3 Calyx drill to Mr. E. L. Torpy of Bombay.

Pumps and Pumping Plants.

9. Air Compressor to the Garrison Engineer, Belgaum,
10. 2½" Kirloskar Centrifugal Pump to Mr. B. S. Jadhav of Sangamner.
11. Myers hand pump to Mr. V. T. Parchure of Poona.
12. Double Barrel Pump to Mr. Shirole of Poona.
13. Double Barrel Pump to Mr. Kanhere of Satara.
14. Double Barrel Pump to Mr. G. K. Gadgil of Poona.
15. Double Barrel Pump to the Superintendent, Empress Garden, Poona.
16. Fire Portable Pump to the Superintendent, Empress Garden, Poona.
17. 6" Centrifugal Pump to Mr. Phadake of Poona.
18. Power Pumping Plant consisting of 6·5 BHP Blackstone engine and 6" Centrifugal Pump to Poona Industrial Exhibition.

19. Petrol engine and pump to Haveri Municipality.

20. Myers bore-hole power pump to the Manager, Sholapur Spinning Weaving Mills, Sholapur.

21. Petrol engine and pump to the Superintendent, Kumtha Farm.

22. Petrol engine and pump to Mr. Kanji Karsandas of Poona.

General.

It was not possible to sell the defibrating machine at Palej, consequently it had to be removed to Surat and stored at the Government Farm.

The receipts during the year on the services rendered, sale of boring machines and spare parts and on the hire of pumping plants boring machines and other sundry articles amount to Rs. 10,380-8-7 as detailed below :—

(July 1938 to End of June 1939)

Rs.	a.	p.	
291	15	1	Hire of Pumping Plants.
423	3	6	Hire of sundry articles.
6,670	1	4	Hire of boring machines.
1,092	8	8	Sale of boring tools and spares.
1,391	0	9	Sale of boring machines.
444	1	6	Sale of sundry stores.
5	0	0	Fees for oil engine class.
32	9	9	Charges for Mechanical Assistance or services rendered outside the prescribed limit.
10,380	8	7	

The above receipts do not include the cost of services rendered and materials used and supplies in connection with repairs executed for Departmental Institutions.

The staff has done exceedingly well and it was impossible to cope with the increased demand without their strenuous efforts and hearty co-operation.

C. G. PARANJPE,
Agricultural Engineer to Government,
Bombay Province, Poona.

Programme of work under the Agricultural Engineer to Government, Bombay Province, Poona, for the year 1939-40.

1. Research on implements including their modification and tests.	(*a*) Modifications and tests with wheat drill, groundnut digger, soil scooper, Ball bearing cart wheels, Tyne cultivator, ridging, implement, etc.
	(*b*) Design of a clod crusher, grass drying appliance and their tests.
	(*c*) Study of indeginous implements and design of new implements if the proposals are sanctioned.
2. Famine pumping ..	(*a*) Inspection of pumping sites on big rivers in the Province for growing fodder.
	(*b*) Keeping the 7 Famine pumping sets in readiness.
3. Advice and help ..	(*a*) Training of cultivator students in driving of engines and pumps.
	(*b*) Periodical inspection of Agricultural machinery.
	(*c*) Advice to Divisional Officers in machinery matters.
	(*d*) Advice to cultivators in agricultural machinery and periodical inspection of their power plants.
	(*e*) Survey of sites and supply of drawings and estimates.
	(*f*) Erections and repairs of machinery for private individuals through the Mechanical Assistants.

4. Higher Technical Assistance	..	(*a*) Help to the Divisional and other Departmental Officers in case of repairs and breakdowns.
		(*b*) Erections of water lifts on Ulhas, and Kundalika rivers in connection with village improvement scheme.
		(*c*) Erections of new machines belonging to the Department.
5. Special works	..	(*a*) Construction of the Striga glass House for the Economic Botanist to Government, Poona and a steel wire gauge cage for the Plant Pathologist to Government, Poona at the Agricultural College, Poona.
		(*b*) Construction of a glass House, Potting Shed at Mahableshwar, a glass house at Sirsi and a glass house at Poona all for the Plant Pathologist to Government.
		(*c*) Construction of a Tobacco curing House at Nipani.
		(*d*) Laying of pipe line and other works at Niphad.
		(*e*) Work in connection with revival of boring activities if the proposals submitted to Government are sanctioned.
6. Running of plants	..	(*a*) Running of the workshops and demonstrations of water-lifts on the Experimental well.
		(*b*) Working of the Tractors for the Gross Hopper Scheme.

7	Sale and hire of machines	.. (*a*) Reconditioning of boring machines, their sale and hire.
		(*b*) Hire of Pumping plant and sale of other stores.
8.	General	.. (*a*) Routine work pertaining to office, workshops and division.
		(*b*) Charge and maintenance of the following :—
		The Nangaon Pumping Plant,
		The boring machines at 3 depots,
		The power bailing and bruising plant at Karajgi. The steam plough.
		(*c*) Closing the Depot at Nadiad on removal of the stock, machines and tools and plant to Poona or elsewhere.

C. G. PARANJPE,
Agricultural Engineer to Government,
Province of Bombay, Poona.

APPENDIX N.

Summary of work done under the Horticulturist to the Government of Bombay, Poona, for the year 1938–39.

I. Administration.

Dr. G. S. Cheema, Horticulturist to Government, B. P. Poona, went on leave for three months from 1st May 1939, his place being taken by Mr. P. G. Dani, Assistant Horticulturist. Mr. B. Nazareth, Superintendent, Ganeshkhind Fruit Experiment Station, Kirkee, was appointed to act as Assistant Horticulturist in place of Mr. Dani, Mr. I. A. Sayed, Demonstrator in Horticulture to act as Superintendent, Ganeshkhind Fruit Experiment Station and Mr. R. D. Gaitonde to act as Demonstrator in Horticulture. There were no other changes.

As required by G. R. Memorandum No. 8490/33 R. D. of 7th June 1938, it is reported that there was no case of the nature mentioned in the G. R. in this section.

II. Education.

The performance of B.Sc. (Agri.) students in Horticulture at the last University Examination was quite satisfactory. There were 60 students for the mali-in-training course at Ganeshkhind Fruit Experiment Station, Kirkee, 20 being awarded scholarships. Two cultivators received short time training in horticultural operations at the Modibag gardens.

III. Research.

1. *Laboratory.*—Investigations on Karwanda relating to drying, preservation of juice and preparation of jelly were continued. It is observed that the fruit treated with sulphur gives a superior dried product. Observations on the quality of fruit by drying fruit in shade are being made. Clarification of Karwanda juice by natural sedimentation has shown that the temperature of 95° F retards sedimentation. Karwanda juice kept in cold storage at 52° F preserved the colour very well.

During the year under report work on Galka (Luffa aegptiaca) was undertaken and products like chappals and fans were prepared out of the fibre. It is observed that clean fibre is obtained by blanching the fruit after shelling. The work in connection with the extraction of chicle from chiku and other trees is on hand.

2. *Cold Storage.*—The respiration studies of Alphonso mango showed that the rate of respiration was at its maximum when the fruits showed the first signs of change in colour and decreased as the ripening progressed. The rate of respiration remained steady during storage at 48° F.

Chilling or browning of the skin of ripe Alphonso fruit at 52° F. did not affect the rate of respiration. It was found that the storage of ripe fruit at 52° F. under partial vacuum prevented chilling. Cold storage trials of Alphonso fruit of "B" stage of maturity picked at different times during the season showed that there was not appreciable difference in the keeping quality.

Cold Storage trials of santras and mosambis received from Aurangabad showed that the mosambi developed a very nice orange colour at 52° F. The santras could be kept in good condition for three months and a half and the mosambis for four months at 40° F.

Soni bananas were chilled at 52° F. but ripened satisfactorily at 56° F. after four weeks of storage. Apples of Delicious variety from Chaubattia (United Provinces) kept well for a year. Peaches from Peshawar remained in good condition for six weeks at 32° and 35° F. and pears from Kashmir for twelve weeks at 32° F.

It was found that onions stored well at high temperatures of 75° to 95° F. though the loss in weight was big. The onions stored for nine months at 90° to 95° F. did not lose pungency. Cabbages wrapped in wax paper remained in a better condition than those kept without wrapping. Shelled peas could be kept in good condition for three weeks at 32° and 35° F. when packed in glass bottles. It was found that beet roots which ordinarily shrivelled could be kept in good condition for about five months at 32° and 35° F when stored in a tin or wrapped in wax paper.

3. *Vegetable Selection.*—Chillies Strain Nos. C-2 and C-9, the selections from Deccan show superiority both in yield and quality. The dried fruits of these selections fetch higher price in the market due to their lustre and appearance.

The Karnatak types, however, have not shown any improvement under Deccan conditions. Selection No. 53-18 from the Dabkai variety, however, appears to be promising.

Brinjals.—Strain Nos. 28-21 and 32-7 of the Gote types yielded 61·2 and 21·5 per cent. respectively more than the local. The former is statistically significant.

Dorli strain Nos. 27-32-6 and 8-3-24 showed 52·4 per cent. and 27·5 per cent. superiority respectively over the local. The former is statistically significant.

IV. Work at the Ganeshkhind Fruit Experiment Station, Kirkee.

(A) *Banana Variety Trials.*—A new plantation of 40 varieties and 48 seedling bananas was laid out in order to find out the best variety from the point of quality and quantity. Observations are being recorded.

(B) *Banana Manurial Trials.*—(1) The experiment of the application of Farm Yard Manure in combination with artificial fertilizers was further laid out for the third test in Fisher's randomization method with 9 plants instead of 6 in each replication. Uniform suckers were selected from the respective treatments from the previous crops and planted.

In regard to the behaviour of sprouting of suckers, it is observed that sprouting starts twelve days after planting, hastens during the next fortnight and is complete by 37 days. Suckers of medium size weighing from 16 to 40 ozs. mostly sprout within a fortnight.

(2) The experiment of the application of Farm Yard Manure alone with Nitrogen varying from 0·2 to 0·8 per stool has shown that 160 lbs. Farm Yard Manure per stool is statistically significant over 40 lbs. Farm Yard Manure, giving 25·3 per cent. higher yield. The economics of the treatment are not yet decisive.

(C) *Mango Manurial Trials.*—It is observed that Farm Yard Manure alone stands first and is closely followed by Farm Yard Manure and fish in respect of height. Farm Yard Manure plus Sulphate of Ammonia encourages girth and Farm Yard Manure plus Niciphos gives a larger number of shoots. These treatments, however, have not given significant results as yet.

(D) *Mosambi Manurial Trials.*—There is no significance in vegetative growth under any treatment but Farm Yard Manure plus Castor cake gives better spread of foliage. Farm Yard Manure alone gives 32 per cent higher yield than the control. Farm Yard Manure plus Bonemeal increases individual weight of fruits.

(E) *Grape Manurial Trials.*—A manurial experiment on grapes (variety Bhokari) was laid out in the Fisher's randomization method.

The observations on the vegetative growth after April and October pruning have shown that treatment, castor cake plus bonemeal, sulphate of ammonia plus sulphate of potash and niciphos plus bonemeal plus sulphate of potash, according to merits are significant over the control namely Farm Yard Manure alone.

(F) *Improvement of Guava by Selection.*—Lucknow No. 24 has given slightly higher yield than Lucknow No. 49.

(G) *Improvement of Pomegranate by Selection.*—The crop could not be treated for any bahar and the selection work could not be done due to pressure of other work.

(H) *Furrow versus Basin method of Irrigation.*—(1) *Mosambi.*—The results of last Year's experiment on different methods of irrigation have shown about 8 per cent. superiority of the furrow method in average yield over the bed method which consumed 32 per cent. less quantity of water.

(2) *Grapes.*—The furrow method consumed 88 gallons of water while the ring method consumed only 74 gallons of water with an average of 10 irrigations per vine, showing abot 18 per cent. increase.

Individual yield records, however, show that the basin method is superior to the furrow method to the extent of 26 per cent. more bunches and 71 per cent. more weight on an average per vine.

(3) *Alternate Bearing of Mangoes.*—Some preliminary observation were made with regard to the correlation of vegetative shoots and flower shoots.

The total receipts of the garden amounted to Rs. 11,932 the expenditure under contingencies being Rs. 14,234.

Prominent among the visitors were all the Honourable Ministers of Bombay Government, the Chief Secretary to Government, the Revenue Secretary and the Honourable Presidents of the Bombay Legislative Assembly and the Council.

V. Work of Modibag.

Facilities for the teaching of the College students were provided for as required. Besides a large number of school parties came for instructions in Horticulture.

The commercial position of the garden was marked by a further improvement. The garden recorded the highest income of Rs. 5,567 against Rs. 5,400 of the previous year thus giving a consistently increasing income for two successive years. The expenditure under contingencies remained the same viz. Rs. 4,340.

No regular experiments are conducted in this garden for want of additional grant and staff but observations are being recorded on the problem of root exposure of citrus trees.

Prominent among the visitors were His Excellency the Governor of Bombay and the Honourable Minister of Agriculture and the Director of Agriculture.

VI. Agricultural Service and Propaganda.

Eleven circulars of Horticultural interest and importance were issued and distributed to the fruit growers through the divisional Deputy Directors of Agriculture.

There were two meetings of the Provincial Fruit and Vegetable Market Committee, held at Bombay, under the Chairmanship of Dr. G. S. Cheema, Horticulturist to Government, Bombay Province, Poona.

Advisory Work.—Technical advice was rendered by personal visits and inspection of gardens in the districts. Budding and grafting were done for the people at many places and grafts and plants sold from the Ganeshkhind Fruit Experiment Station, Kirkee, and Modibag widely. Horticultural instructions were imparted at 9 classes and stalls were arranged at 7 shows. A stall was also put up at the Poona Industrial Exhibition of 1939. Assistance was given to Khan Bahadur V. P. Bhiladwalla of Pardi in mango canning. 1,161 querries were replied by correspondence.

VII. Publications.

1. Cheema, G. S., Karmarkar, D. V. and Joshi, B. M.—

Investigations on the Cold Storage of Mangoes, Imperial Council of Agricultural Research, Miscellaneous Bulletin No. 21.

2. Cheema, G. S. and Karmarkar, D. V.—

The Cold Storage of fruits and vegetables, Imperial Council of Agricultural Research, Miscellaneous Bulletin No. 23.

3. Dubhashi, R. S.—

Horticulture as a profession for the educated in the Province of Bombay. Agricultural College Magazine—1938, Vol. XX, No. 31, pp. 95–104.

4. Sayed, I. A.—

Manufacture of the Lime Juice. Agricultural College Magazine, 1938, pp. 12–18.

5. Sayed, I. A.—

Development of the Cashew nut Industry in India; Agriculture and Livestock in India, Vol. IX, Part I, January 1939, pp. 26–42.

Programme of Work for the year 1939-40.

1. Varietal trials of banana to be continued.
2. Manurial trials on mangoes, mosambis, bananas and grape to be continued.
3. Selection of pomegranate and guava to be continued.
4. Study of the methods of orchard irrigation to be continued.
5. Study of the alternate bearing of mangoes.
6. Study of the root exposure of citrus trees.
7. Study of the extraction of chicle from chiku as well as work on luffa to be continued.
8. Cold Storage and gas storage research.
9. Breeding and selection of vegetable and flower seeds to be taken in hand.
10. Nursery improvement work.
11. Provincial Fruit and Vegetable Market Committee's work.
12. Issue of Horticultural circulars.
13. Holding of special horticultural classes in the districts.
14. Training of agriculturists in horticulture at the Ganeshkhind Fruit Experiment Station, Kirkee.

G. S. CHEEMA,

College of Agriculture,
Poona, 4th September 1939.

Horticulturist to Government,
Bombay Province, Poona.

Abstracts of Publications.

1. *Investigations on the Cold Storage of Mangoes.*

The results of the investigations carried out during the three seasons 1934 to 1937 on the problems of the cold storage of mangoes have been described. Twenty eight different commercial varieties of mangoes were tried. The Alphonso, Peter, Fazri Zafrani, Pairi and Cawasji Patel were found to keep well; Alphonso being the best keeper. The range of temperature from 45° to 48° F. and the " B " stage of maturity were found to be suitable. Alphonso fruit could be stored for 7 weeks in green condition at 45° to 48° F and then ripened satisfactorily at room temperature. Other factors such as size of fruit, different wrappers and packing material and nature of container have also been described.

2. *The Cold Storage of Fruits and Vegetables.*

The results of the cold storage investigations carried out from 1934 to 1937 have been summarized, with special reference to the important factors in the cold storage of fruits and vegetables. The cold storage behaviour of important fruits and vegetables has been determined.

3. *Horticulture as a profession for the Educated in the Province of Bombay.*

The limiting factors such as soil and climate in regard to the cultivation of all the fruit crops of the Province have been presented in a tabular form and an attempt has been made to show how an educated man may step into the profession.

4. *Manufacture of the Lime Juice.*

A detailed account of the methods of extraction and preservation of lime juice together with a list of the essential requisites is given. It is specially useful in view of the fact that al arge quantity of lime is left surplus during a particular period.

5. *The Development of the Cashewnut Industry in India.*

India possesses a monopoly in respect of the cashewnut industry. A large quantity is exported to foreign countries. The cashewnut is a suitable substitute for almond in the confectionery and bakery trades and important bye products are also prepared out of it. The processes of cashewnut curing and distillation of liquor are explained in detail.

APPENDIX O

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURAL ECONOMICS, AGRICULTURAL COLLEGE, POONA, AND PROVINCIAL MARKETING OFFICER BOMBAY PROVINCE POONA, FOR THE YEAR 1938–39.

Dr. M. B. Ghatge continued to work as Professor of Agricultural, Economics and Provincial Marketing Officer, Bombay Province, Poona. There was no change in the personnel. The Assistant Marketing Officers and other establishment too continued as in the past year.

Education.

The subject of agricultural economics was taught to the B.Sc. (Agriculture) class, 81 students appeared in agricultural economics for the University examination out of which 2 only failed, the result thus in this subject was 97 per cent.

A seminar was held one forenoon for the civilians who attended the course when a number of subjects pertaining to agricultural economics and marketing were discussed with the aid of the information collected through investigations and researches conducted by this section.

RESEARCH (A).

During the year the study of family budgets of the farmer in Charotar tract was undertaken with a view to supplement the information collected in the past five years. The method of approach was the same as that of cost accounting. Day-to-day records of receipts and expenditures in cash and kind were maintained. The data collected is now being collated and compiled.

Forty-eight families (17 from Samarkha, 13 from Kasor and 18 from Nisaraya) consisting of 29 *patidars* and 19 non-*patidars* were selected. The details as regards their total proprietary and cultivating holdings, number of members in the family and their animals are as follows :—

Table No. 1.

Caste	Number of farm families	Area owned	Area cultivated	Family members.	Livestock		
					Bullocks	Buffaloes	Calves
		A. g.	A. g.				
Patidars	29	178 2·25	226 28	149	23	37	25
Per *patidar* family ..	..	6 5·5	7 33	5·2	0·8	1·3	0·8
Non-*patidars* ..	19	46 20·75	112–10·75	102	16	24	32
Per *non-patidar* family	..	2 11·5	5 36	5·4	0·8	1·3	1·7

The proprietary holding per *patidar* family worked to 6-5·5 and for non-*patidars* 2-11·5 while the cultivating holding which is made up by taking land on lease (cash or share) worked to 7 A. 33 g. for *patidars* and 5 A. 36 g. for non-*patidars*. The proportion of bullocks to cultivating land worked to 9-8 acres and 7 acres per bullock for *patidars* and non-*patidars* farmers respectively. Agriculturists of this tract followed diversified and mixed farming and as such they grew number of crops and and maintained one or two buffaloes per farmer.

Transactions in cash.—(Farmers transact business in kind and in cash and therefore the distinction requires to be brought out.)

(*a*) *Receipts.*—The percentages of the total transactions given in the table below on the credit side indicate that in the case of *patidars* the rent of land leased out, social income payment made by debtors and borrowers are higher than in the case of non-*patidars*, while the percentages of wages earned by hiring human and bullock labour or permanent employment, sale of ornaments, are higher in the case of non-*patidars* than those of the *patidars*. The percentages of receipts on account of dairying, new debts incurred and borrowings from others are practically the same in both the cases.

Table No. 2.

Sources.	*Patidar* Farmers.		Non-*patidar* Farmers.		The charotar Farmers.	
	Rs. a. p.	Per cent.	Rs. a. p	Per cent.,	Rs. a. p.	Per cent.
1. Balance ..	17 8 7	2·6	11 3 9	2·9	15 0 8	2·8
2. Farming ..	250 10 7	37·9	113 7 9	30·1	96 5 10	35·7
3. Dairying (milk, ghee	104 14 0	15·9	57 7 6	15·3	86 1 9	15·6
Animals' manure.	62 13 0	9·5	35 3 9	9·2	51 14 3	9·4
4. Wages earned ..	2 11 2	0·4	36 3 11	9·7	15 15 8	3·0
5. Leased land ..	12 8 0	1·9	3 5 6	0·9	8 14 0	1·7
6. Employment ..	19 15 10	3·0	27 11 0	7·4	23 0 7	4·2
7. *Dalali*	3 2 5	0·5	....	..	1 14 6	0·3
8. Social income ..	10 6 1	1·6	3 3 6	0·8	7 8 9	1·4
9. Selling of ornaments	1 14 3	0·3	16 2 3	4·2	7 8 6	1·4
10. Payments made by debtors and borrowers.	73 3 11	11·1	17 15 6	4·9	51 5 11	9·4
11. New debts incurred..	57 11 0	8·7	29 7 7	7·9	46 8 4	8·5
12. Borrowed from others	43 6 5	6·6	25 2 10	6·7	36 3 0	6·6
Total ..	660 13 3	100·0	376 10 10	100·0	548 5 9	100·0

(*b*) *Expenditure.*—The percentages of transactions on the debit side given below indicate that *patidars* spend proportionately more on education, social activities, farm and livestock than non-*patidars* whereas the percentage expenditure of non-*patidars* was found more on dress, housing, lighting, tea, smoking, death and ornaments.

Table No. 3.

Serial No.	Items.	Per *patidar* farmer.		Per non-*patidar* farmer.		Per Charotar farmer.	
		Amount.	Per cent.	Amount.	Per cent.	Amount.	Per cent.
		Rs. a. p.		Rs. a. p.		Rs. a. p.	
1	Food ..	69 15 9	11·1	41 11 6	11·7	58 12 9	11·3
2	Dress ..	29 6 6	4·7	18 9 3	5·2	25 2 0	4·8
3	Housing ..	5 8 6	0·9	9 8 9	2·8	7 2 0	1·3
4	Lighting ..	3 3 9	0·5	3 1 3	0·9	3 2 6	0·6
5	Medicines ..	6 1 3	1·0	1 10 0	0·4	4 5 0	0·8
6	Education ..	7 11 9	1·2	0 2 9	..	4 11 9	0·9
7	Religion ..	4 11 6	0·8	2 7 3	0·8	3 11 3	0·7
8	Social ..	30 4 6	4·8	16 5 0	4·6	24 12 0	4·9
9	Tea, smoking cinema, etc.	18 13 6	3·0	17 6 3	4·9	18 4 3	3·5
10	Postage ..	0 2 6	..	0 1 3	..	0 2 0	..
11	Marriage ..	12 10 0	2·0	2 10 3	0·7	8 10 9	1·7
12	Death ..	4 14 9	0·8	13 15 3	4·0	8 7 9	1·6
13	Vessels ..	1 5 3	0·2	0 8 3	0·1	1 0 0	0·2
14	Miscellaneous ..	3 13 6	0·6	1 6 6	0·3	2 14 0	0·5
15	Ornaments ..	4 6 6	0·7	6 11 0	1·8	5 5 0	1·0
16	*Balutas* ..	0 5 3	..	0 3 3	0·1	0 7 0	..
17	Fuel ..	1 8 0	0·2	0 3 0	..	1 1 3	0·2
18	Litigation ..	2 14 6	0·4	1 7 0	0·3	2 5 3	0·4
19	Farm and live stock cost.	265 11 3	42·1	127 12 6	35·7	211 2 0	40·4
20	Miscellaneous cash payments to creditors.	157 5 6	25·0	92 3 0	25·7	131 9 0	25·2
	Total ..	630 14 0	100·0	358 4 3	100·0	522 15 6	100·0

The percentage figures may sometimes mislead readers on the credit as well as on the debit side. It would therefore be necessary to point out that the transactions amounted to Rs. 660-13-3 and Rs. 630-14-0 in the case of *patidars* and to Rs. 376-10-10 and Rs. 358-4-3 in the case of non-*patidars* on credit and debit sides respectively. The difference therefore between the transactions of *patidars* and non-*patidars* is about Rs. 300. Apart from the bigger size of the cultivating holdings in the case of *patidars* the strength of the family in both the cases remaining practically equal the adjustments have to be made by way of standard of living.

Household expenditure in cash.—The average cash expenditure of the families tabulated below after excluding the items of expenditure on account of farm and livestock and credit payment indicates that food forms 32·70 per cent. clothes and clothing 13·9 per cent. housing 3·9 per cent., education 2·7 per cent., medicines 2·4 per cent., social obligations 23·2 per cent., religion 2·1 per cent., luxuries and amusements 10·2 per cent.

Table No. 4.

Serial No.	Items.	Per *patidar* farmer.		Per non-*patidar* farmer.		Per charotar farmer.	
		Amount.	Per cent.	Amount.	Per cent.	Amount.	Per cent.
		Rs. a. p.		Rs. a. p.		Rs. a. p.	
1	Food	69 15 9	33·7	41 11 6	30·2	58 12 9	32·7
2	Dress and dressing.	29 6 6	14·1	18 9 3	13·4	25 2 0	13·9
3	Housing ..	5 8 6	2·6	9 8 9	7·0	7 2 0	3·9
4	Lighting ..	3 3 9	1·5	3 1 3	2·2	3 2 6	1·7
5	Fuel	1 8 0	0·7	0 3 0	0·2	1 1 3	0·6
6	Education ..	7 11 9	3·7	0 2 9	0·2	4 11 9	2·7
7	Medicines ..	6 1 3	2·9	1 10 0	1·1	4 5 0	2·4
8	Luxuries and ornaments.	18 13 6	9·1	17 6 3	12·4	18 4 3	10·2
9	Social marriage and and deaths.	47 13 3	23·0	32 14 6	23·6	41 14 6	23·2
10	Religion ..	4 11 6	2·4	2 7 3	1·8	3 11 3	2·1
11	Miscellaneous ..	4 5 3	2·1	2 0 0	1·5	3 7 0	1·9
12	Ornaments and vessels.	5 11 9	2·8	7 3 3	5·3	6 5 0	3·5
13	Litigation ..	2 14 6	1·4	1 7 0	1·1	2 5 3	1·2
	Total ..	207 13 3	100·0	138 4 9	100·0	180 4 6	100·0

Food.—The total expenditure including cash purchases and home supplies on food articles given in the table below points out that the expenditure on grains is by far the highest. It is more than 50 per cent. of the total expenditure on food. This is followed by milk and ghee the average percentage of which works to 27 per cent. The remaining percentage is roughly equally distributed over edible oils fruits, vegetables, condiments and species and sugar. The non-*patidars* pointing out their comparatively low standard of food.

Table No. 5.

Serial No.	Items.	Per *patidar* family.		Per non-*patidar* family.		Per charotar farm family.	
		Amount.	Per cent.	Amount.	Per cent.	Amount.	Per cent.
		Rs. a. p.		Rs. a. p.		Rs. a. p.	
1	Grains ..	104 14 0	53·8	91 8 3	63·4	99 11 0	57·0
2	Milk and Ghee ..	56 3 6	28·9	33 6 3	23·1	47 3 0	27·0
3	Edible oils ..	8 13 6	4·6	5 1 0	3·6	7 5 9	4·1
4	Fruits and vegetables.	6 9 3	3·4	3 9 9	2·5	5 6 6	3·0
5	Condiments and spices.	7 2 0	3·7	5 12 9	4·0	6 7 3	3·8
6	Sugar and *Gul.* ..	8 8 9	4·4	3 8 9	2·4	6 0 3	3·8
7	Miscellaneous ..	2 11 6	1·2	1 9 6	1·0	2 4 6	1·3
	Total ..	194 14 6	100·0	144 8 3	100·0	174 15 3	100·0

The quantities of grains used per family are tabulated below :

Table No. 6.

Name of grains	Per *patidar* family.	Per non-*patidar* family.	Per Charotar farm family.
	Lbs.	Lbs.	Lbs.
Bajri	548½	532	542
Paddy (converted into rice)	387½	306	355¼
Rice	217¾	148	190½
Kodra	562	791	653

Name of grains.	Per *patidar* family.	Per non-*patidar* family.	Per Charotar farm family.
	Lbs.	Lbs.	Lbs.
Kodri	55	8	36½
Bavto	71	163½	107½
Wheat	122	69	101
Jowar	....	2½	1
Tur	345¾	270	316
Tur dal	63½	61½	63
Math	86	122	100¾
Mug	3½	1	2½
Chora	½	½	½
Udid	17	4¾	12½
Gram	14	5¾	10½
Zalar	....	....	....
Til	19	6½	14
Total ..	2,513	2,492	2,506

The details of other items in the family budget are yet being collated.

The work of preparing a publication embodying the results of the cost accounting work is in progress.

Marketing Survey and Development.

Surveys.—The preliminary reports on Wool and Hair and Cocoanuts were submitted and detailed notes on Jute products and fibre crops except cotton and on myrabollans and Lac were submitted. Surveys on sugar and *gul*, Sheep and goat, Fish and Lac, Mangoes, Apples, Pine-apples and Cashewnuts were continued during the year.

The collection of supplementary information on reports submitted on commodities like Rice, Groundnuts, *Bananas*, Grapes, Strawberries, Coffee, Potatoes, Citrus fruits, Cattle, Milk, Hides and Skins, Ghee and Butter and on Co-operative Marketing and Markets and Fairs formed an

important activity. The maintenance of continuity of information after the submission of reports along with the surveys of new commodities and addition of development work caused very heavy work on the existing staff.

The Assistant Marketing Officers remained out of their Headquarters for about 96 days either for collecting necessary information required as supplementary information or for development work. During this period they interviewed a large number of individuals or groups of individuals. They also collected samples of mangoes, *mosambis* potatoes, butter, *gul*, etc., for the central staff.

2. *Development work.*—It consisted mainly of preparing cases for the regulation of markets, fixation of grades, conducting experiments in grading, issue of authorisation certificates, price intelligence, publicity, conveying and attending conferences and meeting, etc.

3. *Regulation of markets.*—Taking advantage of the existing Cotton Markets Act, proposals for the regulation of 17 cotton markets, existing at Nandurbar, Shahada, Shirpur, Pachora, Chalisgaon, Nandgaon, Malegaon, Wambori, Ahmednagar, Barsi, Pandharpur, Karmala, Bagalkot, Athani, Sanand, Viramgaon, Jambusar were submitted after making thorough enquiries.

4. *Grade specifications.*—Tentative grade specifications for the Alphonso Mangoes from Bulsar were fixed. The grade specifications fixed for *mosambi* were slightly modified in order to remove some of the difficulties. The grade "Extra Special" was not added to the existing egg grades to suit the requirements of the keepers of improved poultry. Zinia rice samples were analysed with a view to fix standard grades.

5. *Authorisation certificates.*—Certificates of authorisation for grading of *mosambi*, eggs and ghee were recommended and were issued. The progress is as follows:—

Commodity graded.	Number of parties authorised.	Quantity graded.	Remarks.
Eggs	8	30,041	Of the authorised only two persons have graded eggs.
Mosambi	9	301,288	Assisted by a Mosambi Grader.
Ghee	3	803 Mds.	One concern ceased.

6. *Grading experiment.*—Experimental Hide Grading Station has been started at Bandra (Bombay) since 5th February 1939. The number of

hides graded from 5th February to 31st March 1939, are 5,030 cow kips, 980 buffaloes and 20 calf kips, in all 6,030. The effect of this experiment has been the reduction in cuts as observed from the following :—

Graded in week ending.	Hides graded.	Total cuts.	Percentage of cuts.	Premium paid by the A. M. A.
			Per cent.	Rs. a. p.
Cow hides.				
9th February 1939	312	130	42	1 11 9
16th February 1939	756	287	38	5 12 4½
23rd February 1939	744	287	38	5 3 10½
2nd March 1939	793	262	33	4 8 0
9th March 1939	834	205	24	4 1 3
16th March 1939	669	167	25	4 9 4½
23rd March 1939	797	268	33	6 6 6
30th March 1939	761	266	35	6 6 3
Buffalo hides.				
9th February 1939	36	18	50	0 7 0
16th February 1939	86	23·6	27	1 1 10½
23rd February 1939	145	27	18	2 11 10½
2nd March 1939	145	16	11	3 6 6
9th March 1939	133	16	12	2 5 3
16th March 1939	121	6	3	2 10 7½
23rd March 1939	178	12	7	4 7 0
30th March 1939	174	17	10	4 6 6

The reduction in the number of cuts brought in more money in the form of premiums to flayers.

Experimental grading of Alphonso Mangoes at Bulsar was undertaken after fixing the tentative grades. The season happened to be of a very short duration. Still 2,839 mangoes were graded and the graded fruit fetched Re. 0-3-5 more per dozen than the ungraded.

Similarly in the case of *mosambi* the experiment of grading was continued from the funds of Provincial Agricultural Department. With the help of a graduate (Mosambi Grader) appointed from 1st January 1939, extensive propaganda of *Mosambi* grading both in Ahmednagar

and Khandesh districts was commenced, but it was soon apparent that the tentative grades, which were fixed during the previous year were not quite satisfactory. They were, therefore, modified by consulting some of the important growers and merchants. After modification, in all 365,560 fruit were handled for grading, of which 301,288 were consigned as graded fruit and 64,272 could not be included in the standard grades as they happened to be *godhadi* fruit or were too small to be included in any of the grades.

The experiments require to be pursued till a large number of growers take to grading and make grading as one of their routine. This can be achieved by removing their practical difficulties, making modifications in the grades whenever required, till they finally settled and are adopted by a large mass.

7. *Price intelligence.*—Collection of daily prices of milk and of buffaloes and their compilation in a weekly bulletin for publication in the Times of India, Bombay, were continued. A link was established between Delhi and Bombay by a daily telegraphic service and also between Bombay and Mehasana by a daily letter service.

8. *Publicity*—(*a*) *Shows.*—A marketing stall was arranged at the Poona Industrial Exhibition to demonstrate grading and graded produce.

(*b*) *Press.*—A number of articles in English, Marathi and Gujarati were contributed to various leading dailies to give publicity to grades and grading. Similarly individual firms, contractors, etc., were approached through post to patronise grades and grading.

(*c*) *Slides.*—About three dozen magic lantern slides were got prepared of the various aspects of market improvements appealing to public.

(*d*) *Leaflets.*—A leaflet about the results of *Mosambi* grading at Rahuri was translated in Marathi. Leaflets on grading of *mosambis* and grapes on grades, its Act and provision, instructions for ghee and eggs were distributed.

9. *Conferences.*—The Provincial Marketing Officer attended the fourth Provincial and Senior Marketing Officers' Conference held at Delhi. He also attended the Ghee Packers' Conference held at Delhi. It was then suggested that a levy of charges on labels was too early especially for producers where development was just afoot. The conferences held in Bombay for fixing standards for Bij groundnuts and Groundnuts was also attended.

10. *Meetings.*—Several meetings were called in connection with the development work. A meeting of the Shahupuri Merchants' Association, Kolhapur was organised to discuss tentative grades for Bij groundnuts. Meeting of the *Mosambi* growers and dealers at Rahuri and Kopargaon Saswad and at Pardi for mangoes attended to fix grades of *Mosambis* and mangoes. A meeting of the tanners and butchers in Bombay and also of flayers was organised and attended. A meeting of the Managing Committee of the Bombay Provincial Fruit and Vegetable Growers

Association was attended with a view to explain them the scheme of fruit development Board on the lines of the United Provinces Board. The Provincial Fruit and Vegetable Marketing Board coopted the Provincial Marketing Officer on one occasion for explaining the scheme of development suggested.

11. *Railway problems.*—Proposals for concessions for the transport of bananas and oranges were prepared and submitted to the Agri cultural Marketing Adviser for taking up the question with the Railway Board. The question of special rates for encouraging long distance traffic of *Mosambis* was taken up with the G. I. P. Railway. Similarly the question of extension of quarter parcel rates for other vegetables was also placed before the G. I. P. Railway along with a few other grievances of *hundekaris*. The question of transport of strawberries and peas from Mahableshwar and Panchgani was also referred to the M. & S. M. Railway and G. I. P. Railway. The railways were approached for concessions to graded eggs and improved egg containers.

12. *Help to others.*—In addition to the help often rendered to the Marketing Officers from Delhi and from other provinces during their tours in this province, help was rendered to the officer accompanying the experimental refregerated van from Rawalpindi and to Mr. Liversage, Agricultural Economist, Kenya Colony.

13. *Enquiries and Miscellaneous.*—A number of querries were received and were attended to. The querries were regarding marketing of cardamom, onions, potatoes, celeray seed, turmeric, export of mangoes to Europe and import of apples and *gul*, market delivery service, transport of figs through ghats, adulteration of milk and ghee and suggestions on various acts, published in local gazette.

The questionnaire issued by the Provincial and National Planning Committee and by the Bombay Co-operative Institute were also attended.

PUBLICATIONS.

1. Improvement of villages in India by Dr. M. B. Ghatge, B.Ag., Ph. D.F.S.S. (Lond.) (Agril. College Magazine, Vol. XXX, No. 1, July 1938).

2. Research in Farm Costing Methods by Dr. K. M. Shah, B.Ag., Ph. D. (Agril. College Magazine, Vol. XXX, No. 2, September 1938).

3. Co-operative Marketing of Farm Products by Dr. M. B. Ghatge, B.Ag. Ph., F.S.S. (Lond.) (Agril. College Magazine, Vol. XXX, No. 3, December 1938).

M. B. GHATGE,

College of Agriculture,
Poona, 30th August 1939.

Professor of Agricultural Economics
and Provincial Marketing Officer,
Bombay Province, Poona.

Programme of work under the Professor of Agricultural Economics and Provincial Marketing Officer, Bombay Province, Poona, for the year 1939-40.

1. To continue compilation and collation of the data of farm costings in the Charotar tract and to incorporate them in a Bulletin.

2. To compile and collate the data collected on Farm Family budgets of the Charotar tract.

3. To teach the subject of agricultural economics in the college.

4. To supervise the marketing survey work, consisting of collection of data and its compilation in preliminary reports of the commodities already under investigation; collection of supplementary information required by Central staff. Writing of the provincial marketing report.

5. To take up developmental work in hand and to take up new developments.

M. B. GHATGE,

College of Agriculture,
Poona, 30th August 1939.

Professor of Agricultural Economics
and Provincial Marketing Officer,
Bombay Province, Poona.

APPENDIX P.

Summary of work done under the Professor of Agricultural Engineering, Physics and Mathematics, Agricultural College, Poona, for the year 1938-39.

Administration.

I was in charge of the section during the year under report except from 4th May 1939 to 28th May 1939 when Mr. A. A. Vasavada held charge for me in addition to his own duties. This section attends to the teaching duties at the College, Research on soil Erosion and district enquiries and advice on Land Development.

Staff.

The staff consists of two assistants—a Lecturer and a Demonstrator, both in the upper subordinate service. A Laboratory assistant attends to the Laboratory and clerical duties.

I. The College Teaching.

(A) Two subjects (1) Physics and Mathematics (2) Agricultural Engineering, together with their laboratory and field work, are taught by this section to the Agricultural students. The students did well in both subjects at an University Examination held in March 1939.

Physics and Mathematics.

Class.	Number appeared.	Number passed.	Percentage passed or exempted.
F.Y.Sc. (Agri.)	86	74	86

Agricultural Engineering.

Class.	Number appeared.	Number passed.	Percentage passed or exempted.
S.Y.Sc. (Agri.)	45	40	89

(B) From this year the present staff has also taken up additional teaching work due to the introduction of the Forest Ranger Course in the College. The subjects of Physics and Surveying and Levelling, both in theory and in practicals and field work were taught by this section.

II. Research.

Levels for the Research schemes on hand for this year have been taken and some of them plotted up. The record is maintained and some results are being worked up.

1. *Study of Soil Erosion.*

(*i*) 30 *Acre plot near Chaursingi hill.*—There were two days of heavy rainfall in June and July followed by light showers up to about the end of August. During September there were four days of heavy rainfall of 2 to 5 inches intensity per day. The latter rainfall caused more erosion in the four guntha plots than the former.

No ploughing was done in the plots this year.

Statement showing silt collected in the trenches below the sub-plots.

Period.	Average silt per plot.	
	4 guntha plots.	3 guntha plots.
	lbs.	lbs.
June to August	443·5	316
September and October	502·5	291
Total ..	946	607

The heavy rainfall period during the year was September and October with 1 day of 5·36″ rainfall and one day of 4·21″.

Silt at the rate of 4 tons to the acre was washed down from the four guntha plots and about 3½ tons per acre from three guntha plots. The average depth of washing amounts to ·016″ per plot.

Although the area in which the observations are taken is eroded year after year further erosion is in progress.

Rainfall Statement.

Year.	Total Rainfall.	Number of rainy days.	Number of days with rainfall of :—					
			0·5″ to 1″.		1″ to 1·5″		1·5″ and above.	
36–37 ..	15·22	71	6		2		1	
			June August.	September October.	June August.	September October.	June August.	September October.
37–38	30·38	89	8	4	..	..	2	2
38–39	38·31	94	11	3	3	1	3	1

Year.	RAINFALL.					
	June.	July.	August.	September.	October.	November.
36–37	3·61	1·61	1·84	1·11	0·46	2·27
37–38	5·85	5·84	1·16	12·50	2·68	0·00
38–39	5·86	7·36	3·37	11·33	7·87	0·12

(*ii*) *Erosion in Gullys.*—Two gullys under observation in the plot show the continuity of erosion of bed and banks.

(*iii*) *Line on steep and moderate grades.*—These continue to show a slight degree of further erosion.

2. Katraj Valley Terrace Observations.

Some of the terraces show silt deposition.

3. Divaghat Area Observations.

Here also dry stone bunds put up across the gullys have shown silt filling as in the past. The filling in the large bund put up across a gully is not appreciable. This has to be watched for some years as the area is fairly eroded. Some of the stone bunds have breached at places. The matter is under consideration and in consultation with the Forest Department measures will be taken.

4 and 5. Karjat and Pashan Valley Terrace observations.

These lines are under observation.

6. Erosion in Gullys near Gujarat Rivers.

This problem has been appreciated. A Bunding Officer for Gujarat has been appointed. This item has been included in the programme for investigation this year. The Bunding Officer is advising cultivators for field bunds and minor works. This is a large scale work requiring observation and research investigation on the spot.

7. Erosion and Silting observations in Southern Division and South-Central Division through the Agency of the Bunding Officers.

Bunding Officers of South-Central Division, Southern Division, North-Central Division and Northern Division were busy in conducting cultivators' training classes all throughout the year and hence this has been dropped.

8. Register of Land Development Schemes.

The undersigned visited some typical places in the districts, where, erosion takes place and preventive measures adopted. Suggestions for modifications where necessary were offered. It is now proposed to call for list of important land development schemes every two years for the register purpose.

9. Compilation of Erosion Development Literature.

All available and latest literature on the subject regarding India and foreign countries continues to be compiled. A pamphlet in Marathi and Kannada was printed with illustrative photos and is made use of by the Bunding Officers. A similar one in Gujarati from the material available is prepared by the Bunding Officer, Gujarat, and submitted to the Director of Agriculture.

10. Tidal Bunds and Erosion in Gujarat and Bhal Tract.

The undersigned inspected along with the Deputy Director of Agriculture, Gujarat, Surat, the tidal and salt lands belonging to Mr. Syed Aminuddin, I.C.S. at Abwa near Surat in the Surat district and made suggestions with regard to the possible lines of preliminary improvement and development for the present and a report is sent in for the same.

The Bhal land requires investigation.

Suggestion for further line of research in erosion and preventive measures were put up before the Director of Agriculture and he has called for details of schemes to be put up before Government for consideration and sanction.

III. Advisory and Propaganda.

The following work was attended to in several places of the Bombay Province.

I. *Northern Division.*—

(*i*) *Ahmedabad and Panchmahals Districts.*—Country side especially in Prantij Taluka were inspected with the Deputy Director of Agriculture, Gujarat and suggestions offered.

Sites were also selected for Bunding classes to be held in the two districts.

(*ii*) *Broach District.*—At the suggestion of the Deputy Director of Agriculture, Northern Division the site of River bank and field erosion due to bank cutting and floods in Sir Edulji Modi's Estate at Mandwa Bujrag was visited and necessary suggestions offered for further action to the manager of the estate.

(*iii*) *Surat District.*—Tidal and salt lands at Abwa about 5 miles from Surat were visited and suggestions for improvement offered.

II. *North-Central Division.*—

(*i*) *Nasik District.*—At the request of the Deputy Director of Agriculture, North-Central Division the survey of Mr. Jivanlal Shah's area at

Belgaon Dhaga a few miles from Nasik was carried out. The drawing showing necessary land development works was sent.

(*ii*) *West Khandesh District.*—Inspection and advice were rendered for the Dhulia Sewage plot Development and other fields near Dhulia.

The Vijaya Vyayam Shala plot on the River bank at Dhulia was surveyed and a map with suggestions for terracing supplied.

Another plot at Mohadi near Dhulia was surveyed for drainage and removal of flood water and drawing were supplied.

III. South-Central Division.

(A) *Sholapur District.*—The Bunding works carried out were inspected and suggestions offered where necessary.

The Bunding on the Dry Farming area at Sholapur and the erosion study carried out there was gone into.

(B) *Poona District.*—(*i*) *College Farm.*—(*a*) Levels for the College Land under sewage water and for the sewage channel were taken up for the Farm Superintendent.

(*b*) Contour plan of a part of the farm area showing the proposed bunds was prepared and supplied to the Professor of Agriculture.

(*c*) Suggestions were given regarding the diversion of Nala water into the fields of Mal land for supplimentary flooding and irrigation.

(*ii*) *Anath Vidyarthi Griha plot.*—At the instance of the Authorities of the Anath Vidyarthi Griha, their plot on the Poona-Satara Road was visited and necessary advice regarding land development, lift irrigation etc. was given.

(*iii*) *Prabhakar Wadi, Pashan.*—A contour plan for a part of the the Prabhakar wadi farm was prepared and supplied and suggestions for necessary land development were given. Principal Gokhale has carried out Terrace Bunding in this area on the basis of the plan supplied to him.

IV. Classes.

(*i*) *Advanced Bunding Class.*—It was believed necessary to have a class for advanced training in Bunding for 3 months to follow up the training given in the short training classes conducted by the Deputy Directors of Agriculture and accordingly as per instructions issued in Government Resolution Revenue Department No. 5279/28, dated 18th November 1938, such a class was held at Poona from 15th November 1938 to 13th February 1939, conducted by the undersigned.

45 cultivator students (15 selected by the Deputy Directors of Agriculture, North-Central Division; South-Central Division and Southern Division from each of their division) attended the class. Most of them were young men 18 to 30 years of age. A place near the College was secured for Lodging and a common mess was arranged. The Sanitation was satisfactory.

The students worked from 8 to 11-30 a.m. and 2-30 to 5-30 p.m. The attendance was regular. Two students from North-Central Division left the class early.

The students worked in three batches according to their division (1) North-Central Division (2) South-Central Division (3) Southern Division under Messrs. J. N. Purandare, M. K. Shirole and S. G. Kadkol, Bunding Officers from the respective divisions. Mr. S. P. Patel, Bunding Officer, Gujarat who was deputed for training in Land Development attended the class.

The students had good field practice with Surveying and levelling instruments as per detailed programme previously prepared. They, carried out contour survey of an area of 52 acres and prepared plans and drawings and put up field bunds and waste weirs. The technique of Bunding and waste weirs was fully gone into. They were taken round to see the bunding works in various parts of the Sholapur, Bijapur, Ahmednagar and Nasik Districts.

In the periodical and final tests the students did well.

In addition the students had extra class training in P. T., Scout games, first aid, general sanitary and other information by way of magic lantern slides and visited places of general and Agricultural interest round about on Sundays.

(*ii*) *Bunding classes conducted by the Deputy Directors, North-Central Division, South-Central Division and Southern Division.*—The undersigned has been associated for general supervision, inspection and co-ordination of work of the classes held at various centres. The classes were conducted according to the plans of teaching previously discussed with the Deputy Directors of Agriculture.

The following classes were visited during the year :—

North-Central Division—Dondaicha.

South-Central Division—Alandi.

Southern Division.—Bagalkot, Nargund, Chachadi and Athani.

Northern Division—Mirakhedi.

(*iii*) *Assistant and Deputy Collector's Class.*—Lectures on erosion and irrigation were given to the Officers deputed for the special training in Agriculture and allied subjects.

(*iv*) *Advanced training to Officers on deputation for erosion control.*— The following officers deputed for training in Bunding and erosion control were trained for the work :—

(1) Mr. K. S. S. Iyer, Lecturer in Agricultural Engineering, Nagpur Agriculture College, was trained for 15 days. He was also shown various works in the Province.

(2) Mr. S. P. Patel, who was appointed a Bunding Officer in Gujarat, was deputed by the Deputy Director of Agriculture, Gujarat, Surat, for training in soil erosion and Bunding. He was given intensive training for three months from 15th November 1938 in the subject.

(3) Mr. S. C. Talesara, an officer in the Institute of Plant Industry, Indore was deputed by the Director, Institute of Plant Industry and Agricultural Adviser to States in Central India and Rajputana, Indore, for training in Bunding and soil erosion for period of two months from 1st April 1939. He was also given training in the subject.

Corruption.

Proper supervision is maintained to see that there is no corruption in this section and there is no case of corruption to report during the year under report.

J. P. TRIVEDI,

College of Agriculture, Poona, 2nd August 1939.

Professor of Agricultural Engineering, Physics and Mathematics.

Programme of work under the Professor of Agricultural Engineering, Physics and Mathematics, Poona, for the year 1939-40.

The following will be taken up during the year :—

(1) Further observations on the Erosion plots near the College and Bunding and other preventive measures.

(2) Diva Ghat Forest Area—observing effect of erosion and Bunding and gully erosion prevention.

(3) Observations in the Katraj Valley.

(4) and (5) Observations in the Pashan Valley and Karjat Rice terraces.

(6) Visits and advisory work in the District for Land Development.

(7) Supervising visits to Bunding Classes in the district.

(8) Conducting three months advanced Bunding Class at Poona.

(9) Proposed Research and other items of investigation and execution that would be sanctioned during the year.

J. P. TRIVEDI,

College of Agriculture,
Poona, 2nd August 1939.

Professor of Agricultural Engineering,
Physics and Mathematics.

APPENDIX Q.

Summary of work done under the Professor of Entomology, Agricultural College, Poona, for the year 1938-39.

Administration.

Professor T. N. Jhaveri, the permanent Professor of Entomology proceeded on leave preparatory to retirement from the 5th December 1938 and Dr. V. G. Deshpande, Lecturer in Entomology was appointed to act in his place. Since then Dr. Deshpande has been in charge of the section. Mr. G. A. Patel, B.Sc. (Agri.) has been taken up in place of Dr. Deshpande and is officiating as the Lecturer in Entomology since 19th December 1938.

Work.

The work done by this Section is divided under the following heads:—

I. Education.
II. Research on important insect pests.
III. Advisory work.
IV. Service to the public.

I. Education.

This Section has to teach two subjects—Zoology to the First year students and Entomology to the Final year. One more student was admitted during the year for post-graduate work, but his head-quarter was fixed at Belapur Road for the study of the grasshopper pest in the sugarcane crop. So in all there were three students for the M.Sc. degree. One of these post-graduate students admitted in 1937 has nearly finished his work and will shortly submit it to the University.

II. Research.

During the year under report Research work was carried on on the following pests:—

1. Control of aphis by the tobacco waste extract on peas and cabbage.
2. Experiments and trials of cyanogas and sulphur against mangohoppers.
3. Study of the grasshopper pest in the Belapur area.
4. Study of fruit flies.
5. Betelvine Bug.
6. Control of hoppers on fig.
7. Lang pod borer.
8. Trials of insecticides.

The last 4 items (5 to 8) were not included in the programme. However some work has been done on each of these items which has been recorded under each head.

1. *Control of pea aphis.*—The extract of the 'tobacco waste' was found useful in controlling aphis on peas and cabbage in small field trials and it was decided to try this extract on larger areas for demonstrating its effectiveness against this pest. But no separate work was undertaken by this section on this pest as all attention was directed to the large scale demonstration trials of this material in different areas for which a special grant was provided for by Government. These trial plots were taken up at Kalewadi, Bhiwadi, Khed Shivapur, and Mahableshwar, and were treated with tobacco-extract at regular intervals from the germination till the formation of pods on the crop. The following are some of the important observations on the pest and the treatment:—

(*i*) The pest requires to be treated from the very beginning.

(*ii*) The number of sprayings varies from 5 to 7 according to the weather and the vigour of the crop and the incidence of the pest.

(*iii*) It is the habit of the insects to be enclosed between the tender leaves and hence great care has to be taken to reach such spots with the spray.

(*iv*) If the spraying is not thorough re-infectation takes place.

(*v*) Weekly spraying are found generally sufficient, but in some cases the interval has to be shortened.

(*vi*) In the demonstration trials conducted at different centres the pest was controlled in almost all the fields except one or two where spraying could not be given in time owing to pressure of work and shortage of men.

(*vii*) In general the cultivators were satisfied with this treatment but requested that the material and the spraying machines should be made available to them by Government.

As the attention of the staff of the Section was directed to these demonstration trials, the work of the control of cabbage aphis could not be attended to. But no experiments are even necessary now to prove the efficacy of the 'tobacco waste' extract in controlling aphis on peas and other crops.

2. *Experiments and trials of cyanogas and Sulphur against Mango-hoppers.*—According to the programme laid down, trials with the application of sulphur and cyanogas mixture in the pre-flowering stage were conducted at Chembur near Bombay and Bulsar in South Gujarat. The mixture was applied to the mango trees in the proportion of 6 parts

of Sulphur with one part of cyanogas. In all two to three dustings were given. The experiments with sulphur-cyanogas mixture did not show any decided advantage.

Along with these trials the demonstrations of the methods of control by dusting of Sulphur were carried out at the same places. This latter work was continued over a period of about two months a full report of which has been submitted to the Director of Agriculture by the Secretary of the Insect Pest and Plant Disease Committee, Poona. In this report observations regarding the habits and behaviour of all the three species of hoppers have been described, from which is quoted the following pertinent extract :—

"There are three species of mango-hoppers, *Idiocerus Atkinsoni*, *I. niveosparsus* and *I. clypealis*. Although these species are found in all the mango growing areas, *I. niveosparsus* predominates in Gujarat, whilst *I. clypealis* is comparatively the most important species found in the Ratnagiri district. All the three species breed during the flowering season though *I. atkinsoni* does so to a less extent and is very predominent in the monsoon when the other two species are practically non-existent. Of the three species, *I. clypealis* appears to be most susceptible to the action of sulphur, and this probably explains why the sulphur treatment has been attendant with marked success in the Ratnagiri district. The other two species are somewhat resistant to the effect of sulphur, and since *I. atkinsoni* is generally not found breeding to a large extent in the flowering season, the problem of control of mango-hoppers in South Gujarat is mainly the control of *I. niveosparsus*. Due to comparative resistance to sulphur shown by this species, the need for repeated dustings in Gujarat effectively to deal with the pest is obvious. In the Bombay Suburban area, however, both *I. clypealis* and *I. niveosparsus* are predominatingly found, and repeated applications of Sulphur are necessary to check the pest as in Gujarat".

3. *Study of the grasshopper pest in the Belapur area.*—This grasshopper has been damaging the sugarcane crop on the Pravara canals for the last seven or eight years, but till last year the damage was not serious and the area of infection was also very small ; hence due attention was not paid to the control methods till the current year when the pest increased enormously owing to favourable conditions. The rains (monsoon) commenced very early (April) and the grasshoppers emerged in large numbers from the egg masses laid in the previous year. These nymphs for a time fed on the grasses on the bunds and afterwards entered the sugarcane fields and attacked the crop. The damage consisted in the destruction of leaves, and the crop was practically stripped in many fields. Some of the cultivators tried the control measures but a large majority was unprepared to combat the pest. So the damage continued unabated

and the situation really was very serious. The observations made on this pest during the year under report were as follows:—

(*a*) The predominent variety of grasshoppers at Belapur was the "Hieroglyphus banian"(elongata) but the smaller variety also was present to the extent of 6 per cent.

(*b*) *Egg masses.*—The usual place of egg-laying was the inner side of the bunds surrounding the fields at a depth of 3 to 4 inches. The intensity of laying the eggs varied greatly in different plots and even in the same plots at different places. The proportion was as follows:

(*i*) Out side the field	1
(*ii*) Inside the field	1·8
(*iii*) Inside bunds of the fields	2·1
(*iv*) Outer bunds of fields	8·3

Egg masses were also observed in fields adjoining the affected areas at a distance of 50 feet.

The sugarcane grasshopper is decidedly larger in size than the smaller species found on rice known as "Hieroglyphus banian". This is also evident from sizes of egg masses. The measurement of 250 egg masses of the sugarcane grasshoppers taken at Belapur gives the following minimum and maximum sizes:—

I. STATEMENT.

Variety.	Minimum size of egg masses.	Maximum size of egg masses.
H. banian Var elongata	16·4 mm.	22 to 26 mm.
H. banian	8 mm.	18·5 mm.

(*c*) *Poison trials.*—Different poisons were tried in the cages and the fields against this grasshopper. While conducting these poison trials it was seen that in the fields baits were absolutely useless in the case of this grasshopper as it never comes to the ground for feeding. Poison baits were placed in the sugarcane crop and it was found after 24 hours' watching that not even one grass-hopper touched the bait. The results of the trials of different poisons can be seen from the following tabulated statement.

II. Statement.

No.	Place.	Trial.	Poison.	Proportion.	Percent. killin controlled area.	Percent. killin controlled area.	Percent. kill due to poison.
1	cage ..	dusting ..	Calcium arsenate	1 : 20	35	30	5
2	cage ..	dusting ..	Sodium fluosilicate.	1 : 4	43	30	23
3	cage ..	Baits ..	Hopkil ..	1 : 1	86	12	74
4	cage ..	Baits and Fresh leaves.	Hopkil ..	1 : 1	60	12	48
5	Field ..	Dusting ..	Calcium aresnate	1 : 20	84	30	54
6	Field ..	Dusting ..	Calcium arsenate	1 : 20	12	4	8
7	cage ..	Dusting ..	Sodium fluosilicate.	1 : 4	36	12	24
8	field ..	Bait ..	Calcium arsenate	1 : 20	20	4	16
9	field ..	Bait ..	Hopkil ..	1 : 1	22	4	18
10	field ..	Bait ..	Hopkil ..	1 : 1	8	4	4

(*d*) General observations—

(*i*) The grasshopper has the tendency of remaining on the plant for the major part of its life and spend very little time on the ground.

(*ii*) The adults have the habit of coming out of the field for enjoying the sun in the morning and in the evening.

(*iii*) The grasshopper is found to attack all the varieties of cane grown in the tract, but it is seen to prefer *Pundia* to other varieties.

(*iv*) It was also found attacking other cereals like *jowar* and maize to a very great extent.

4. *Fruit flies.*—The collection of fruit flies on mango, guava, citrus was continued throughout the year by trapping with Clensel which confirms the previous observations that the fruit flies are found throughout the year. The following two statements will clearly show the distribution of flies trapped on different fruits during the year under report.

III. Statement.

Mango fruit		Guava fruit		Citrus fruit		Variety of fruit fly.
male.	female.	male.	female.	male.	female.	
556	634	133	126	78	97	Chætodacus ferrugineus.
63	15	2	26	1	2	Chætodacus correctus.
58	81	6	58	5	3	Chætodacus Zonatus.
6	..	2	..	1	1	Chætodacus diversus.
61	35	64	37	20	15	Chætodacus cucurbitæ.
744	765	207	247	105	118	Total No. of flies.

IV. Statement.

Number of traps on mango trees	Number of traps on Guava trees	Number of traps on Citrus trees
803	992	434

From these two statements it is clearly seen that the number of trapped flies is always the largest from mango fruits. An attempt was made during the year under report to try the poison baiting, but the area not being isolated the trials were inclusive. However there are indications that both of these methods if carried on simultaneously, the pest will be controlled to a considerable extent. The trials will, therefore, be continued during the next year.

5. *Betelvine Bug.* (Disphinetus mæsarum) :—This is the second year of the Scheme for the investigation of the Betelvine Bug financed from the Sir Sassoon David Trust Funds the scheme is under my control and guidance. According to the programme the study of the life history of this pest has been completely finished and now the investigation, regarding the control methods will be taken up in hand. The Investigator visited some places in the Province for the survey of the pest. The full report of the work will be separately submitted with all the details.

6. *Fig hoppers* (Typhlocyba spices) :—Observations made on this pest showed that the curling of leaves could not be stopped by the spraying of fish oil rosin soap. The number of hoppers observed at any time during the year is always very small and it has to be ascertained whether the curling is really due to the attack of the hoppers. Observations will be continued next year on this habit of the pest.

7. *Lang pod borer* (Heliothis armigera) :—During the year under report one of the cultivators in the Bara tract requested the Professor of Entomology to give on the spot the demonstration of the methods of control advocated by the Department of Agriculture against this pest. Accordingly the Professor of Entomology visited the Bara tract in the month of March 1938, and arranged for the demonstration to the people; but as these methods were not followed by the cultivators it seemed that they did not much appeal to them. For the study of the pest the Professor of Entomology submitted a small scheme to the Director of Agriculture which was not sanctioned and hence no work could be undertaken on this pest.

8. *Trials of insecticides.*—During the year under report the following insecticides were tried and the results are tabulated below :—

V. STATEMENT.

Name of the insecticide.	Insect and pest against which it was tried.	Remarks.
Pawara insecticide ..	Cockroaches and Bed bugs, Mosquitoes.	More effective against cock roaches and bed bugs.
Ben's insecticide ..	Grain weevils bedbugs Cockroches and black ants.	Found effective against all the insects.
Nakki powder ..	Rice weevils wheat weevils, cockroach and black ants.	Not effective.
Hopkil insecticide ..	Grasshoppers. ..	Not very effective but more expensive than other poisons.

III. Advisory work.

During the year under report 527 inquiries were received from various sources. These were attended to by correspondance by Professor

Jhaveri, and myself. The following is list of inquiries received during the year which will clearly show the varied nature of the work that is required to be done by the section :—

	Name of the item.	Number of inquiries.
1.	Pest of Cereals	26
2.	Pest of Fruits	66
3.	Pest of Oil seeds	9
4.	Pest of pulses O	10
5.	Pest of sugarcane	29
6.	Pest of vegetable	74
7.	Fumigation of seeds	6
8.	Silk work	16
9.	Lac cultivation O	5
10.	Bee keeping	19
11.	Katra (Gujarat Hairy caterpillar)	7
12.	Surface Grasshoppers	6
13.	Tobacco	5
14.	Ginger	3
15.	Control of white ants	19
16.	Insecticides	17
17.	Identification of insects	4
18.	Trials of insecticides	4
19.	Supply of Entomological materials	30
20.	Pathological certificates	202
21.	Control of field rats	24
22.	Control of pest on ornamental plants	7
23.	Hairy caterpillars on grasses	5
24.	Lang pod borer	3
25.	Betelvine Bug	9
26.	Pest of stored products	5
27.	Supply of insects	10
28.	Control of red ants	7

The Professor of Entomology, toured during the year under report for 98 days and visited 74 places for advisory and investigational work.

The Lecturer toured for 174 days and visited 78 places. In addition to this touring was done by the other staff members of this section in connection with the demonstration trials for the control of aphis on peas, and mango hoppers at various centres. In fact, practically majority of the staff members was away from the head quarters for a good length of time without in any way affecting the teaching and the other office work. Very naturally the remaining staff was very heavily worked.

IV. Service to the public.

During the year under report a large number of demands was received from different Agricultural officers of this Province as well as from various other institutions outside the Province regarding the supply of information, advice, silk worms, insects and insect-show-cases. Special mention may be made about the supply of Exhibits to the Tripuri Congress, Industrial exhibitions at Bombay and exhibitions at Broach, Surat, Anand, Kolhapur, Borada Karnatik College, Dharwar, Sanjan and Sind. All these were complied with.

Lastly I would like to remark that all the members of the staff of my section worked satisfactorily, though under a great strain. Unfortunately this section, looking to the heavy and varied work it has to do, is understaffed. Since the creation of this independent section the work has been steadily increasing and the Agricultural Sub-overseer-cum-clerk is unable to cope with the increased work. As the clerical work has increased since 1934 the Agricultual suboverseer has many times to be taken away from teaching and other work of the section. In short by this arrangement the work of this section is suffering to a considerable extent. I have therefore, the honour to request the Director of Agriculture for a provision of an independent clerk for this section.

Curruption.

Proper supervision is maintained to see that there is no curruption in this section and there is no case of curruption during the year under report.

V. G. DESHPANDE,

College of Agriculture,
Poona, 31st August 1939.

Professor of Entomology,
College of Agriculture, Poona.

Programme of work for the year 1939-40.

(1) Demonstration trials of Sulphur dusting against mango hoppers for confirming the results obtained in 1938-39.

(2) Observations on fig hoppers to ascertain the curling of leaves and their other habits.

(3) Study of grasshopper pest in the Belapur area.

(4) Fruit flies—an attempt will be made to try the effect of poison baiting along with trapping.

(5) Betalvine Bug—Trial of control methods.

V. G. DESHPANDE,

Professor of Entomology,
College of Agriculture, Poona.

College of Agriculture,
Poona, 31st August 1939.

APPENDIX R.

Summary of work done under the Officer in charge of Research Work in Apiculture, Ganeshkhind Fruit Experiment Station, Kirkee, for the year 1938–39.

The Scheme for research in Bee-keeping was started in May 1938 at Ganeshkhind Fruit Experiment Station, Kirkee, Poona. During the year under report the centre devoted its attention to the following items :—

I. Survey of the Province with a view to find out what tracts are suitable and what type of bees are available.

II. Work in Research side—four items.

1. Settling of Apis-indica colonies brought from Gandhi Ashram, Tiruchengodu, south India, and trials of domesticating the hill variety of Apis-indica found in the province.

2. Experiments with other wild bees—Exploring the ways to domesticate them, cross-breeding etc.

3. Artificial feeding of bees in times of scarcity.

4. Bee-pasturage.

III. Training of students.

IV. Demonstration activities.

V. Advisory.

I. Important places of the following districts were visited. Poona, Belgaum, Dharwar, Bombay and suburbs, Ahmednagar, East and West Khandesh, Surat, Ahmedabad, Thana and North Kanara. The distribution of the various kinds of bees was found to differ from place to place. Apis-dorsata and Apis-florea were found in great numbers mostly in the interior part of the country in dry tracts and hill sides whereas Apis-indica and melipona were found along the coastal places and near about the ever green forests. Apis-india was not found in sufficient number in North Gujarat, Panch Mahals and Ahmednagar. All the four kinds of bees were found in abundance throughout North Kanara and especially Sirsi, Yellapur, and Honavar side many colonies of bees of Apis-indica and melipona were found under semi-domestication.

II. Work in Research side—four items.

1. Observations made during the course of settling of Apis-indica brought from south India and domestication of local Apis-indica.

(A) *Apis-indica from south India.*—During the course of the year ten colonies of Apis-indica (plain variety) were received for trials from

Tiruchengodu, south India out of which three colonies yielded honey 2 lbs. 4 ozs. Two of them got dwindled due to the constant disturbance at the Poona Industrial Exhibition 1939, and ultimately absconded. Four of them when arrived from South India were weak in strength and consequently they were merged with the rest. When the local bees were brought some of them in their new surroundings entered the hives of the plain type and killed four queens. At the end of the year there were four colonies in working order.

(B) *Local Apis-indica.*—Out of the twenty six colonies captured and brought to the apiary, twelve came from Mundwa, nine from Poona, two from Mahàbleshwar and others from Belgaum, Dharwar and Sirsi, one from each place, out of which three yielded honey 2 lbs. 2 ozs. Twelve of them absconded for no apparent reason, out of which six did so leaving their queens behind, quite contrary to their nature. One absconded killing the queen. Six colonies were found attacked by wax-moth. In four queenless colonies the early appearance of laying workers was noticed. The bees were noticed to have robbing tendency and were seen very persistent in entering weaker colonies and killing very often the bees if there be any obstruction. Also it was noticed that the bees get easily excited and run down the combs with the slightest disturbance. Further it was observed that due to the prolonged time varying from one and half to two months taken by the greater number of colonies to get settled, the untimely spraying and dustling of flowers of certain fruit trees with poisonous chemicals in the garden and the inevitable frequent disturbance to the bees caused during experiments and training of students, the bees did not yield more than four and half pounds during the year.

In order to study other details like the prolific nature of bees in breeding and their capacity in storing honey two colonies have been kept without frequent disturbance in secluded places in the garden since February and June. For comparative study a few more colonies from different places will be brought and settled. Also in selected colonies new queens will be reared and introduced in the coming season October-November.

2. Five attempts were made wherein seven Rock-bee combs with bees were successfully transferred to frames specially constructed to study more about their behaviour and life history, but for one reason or the other they did not stay in their new environments for a long time. Out of seven colonies captured only in one colony the bees continued to remain for eight days while the rest absconded in a day or two. For further observations, at Moorsawar Mutt, Hubli, six special frames have been fixed to places where the Rock-bees used to frequent to see whether the bees are attracted to them.

When four eggs and two larvæ of two days old taken from a Rock-bee comb were grafted to a queenless colony of Apis-indica it was observed that three days later the bees have removed all the grafted eggs

and larvæ of the foreign origin. So far, with skilled handling, the bees were found to be docile and gentle. In one of the observations it was found that the Rock-bees also reared their queens in separate cells like other bees. The queen cells were considerably large in size. This fact has not been given in any of the bee-literature available.

Six attempts were made for the domestication of Apis-florea out of which only one colony remained for a period of six months and yielded 4 ozs. of honey while the rest deserted after a short stay varying from one to twenty five days.

A colony of melipona bees brought from Sirsi in June is progressing very well.

3. *Artificial feeding.*—Four colonies were treated with pollen obtained from Rock-bee combs with the result that three of them improved while one did not show any improvement. The improved colonies showed a sudden increase in the number of field bees and the presence of large number of eggs. Further observations on this item are under study.

4. *Study on Bee-pasturage.*—Seventy four plants of this province were found to attract the bees and were classified according to their flowering season, locality, pollen or nectar yield, relation to particular kind of bees, etc. Out of them the following flowers were found visited by a large number of Apis-indica :—

Adhatoda vasica, Eugenia Jambolana, Vitex Negundo, Calophyllum-inophyllum, Pongamia glabra, Cucurbitaceous plants, Terminalia belerica, Terminalia Arjuna, Terminalia tomentosa, Feronia Elephantum, Lescaena glauca, Ipomea staphylina, Psidium Guyava, Musa sapientum, Tamarindus—indica, Albizzia Lebbek, Zea Maize, Antigonon leptopus, Salvia, Dombeya mastersii, Helianthus annuus, Justicia—gendarussa, Cocos nucifera, Phoenix sylvestris, Sapindus trifoliatus, Jacquemontia, Rose, Portulaca, Andropogon sorghum, Pennisetum typhoidum, Gossypium varieties, Sesamum, Strobilanthus, etc.

It is quite interesting to note that the following flowers producing sufficient quantity of nectar and pollen were not seen visited by Apis-indica though they were in large numbers and within easy reach of the bees.

1. Pancratium parvum. 2. Lantana Camara. 3. Duranta plumieri.

III. *Training of students.*

In January-February and in May-June 1939 two short courses in Bee-keeping were held, in which seventy-five students attended. Fifty-eight of them came from Bombay Province while the rest came from various Indian States and other provinces.

IV. *Demonstration activities.*

During 1938–1939 the centre attended three exhibitions organised by :—

1. The All India Educational Conference Exhibition Committee, Bombay.
2. The Science Exhibition Committee, Karnatak College Dharwar.
3. The Poona Industrial Exhibition Committee, Poona.

V. *Advisory.*

243 enquiries regarding the supply of information on Bee-keeping, such as identification of bees, handling of bees, Bee-literature, Bee-appliances etc. were replied during the course of the year under report.

Mention can be made regarding the growing interest about the subject among the public. A few citizens in Poona, Mahableshwar, Belgaum, Dharwar, and North Kanara have started keeping bees in improved methods and from time to time possible guidance was rendered.

From March 1939, the All India Village Industries Association has started a Bee-keeping class at Honavar and is being subsidised by Government. To meet the further interest of the public of other places, a consolidated scheme is being prepared for submission to Government for consideration.

Among other miscellaneous items of work done, reference may be made of the contribution of two articles and three reviews on books on bees received.

The scheme has been extended by Government for a period of another year i.e. till the end of February 1940, and the programme for the year (1939–40) is as below :—

1. Continuation of the survey work and submitting a consolidated report.
2. Further studies on the research items mentioned under the year under report.
3. Settling of more colonies of Apis-indica from various centres for comparative study on the honey yield and behaviour.
4. Observations on Bee-enemies and diseases.
5. Further training of students.

(Signed) H. VISWANATHAN,
Officer in charge of Research Work
in Apiculture.

List of Agricultural Bulletins published by the Department of Agriculture and kept for sale at the Government Book Depot, Bombay

[*N.B.*—Bulletins marked in asterisk are out of stock and not available for the present.]

No.	Year.	*Subject.*	Price. Rs. a p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa ..	0 8. 0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D. ..	0 4 0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ..	0 4 0
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